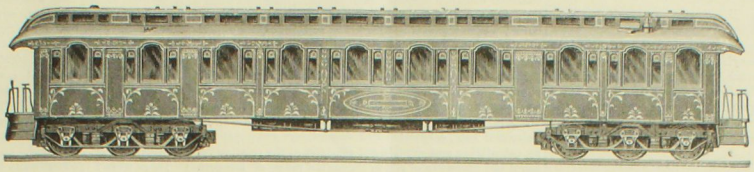
NATIONAL CAR AND LOCOMOTIVE BUILDER.



VOLUME XVIII. NUMBER 5. | MAY, 1887. | SINGLE NUMBERS, TEN CENTS. $1.00 PER ANNUM.

Miscellaneous Items.

LARGE quantities of metal ties have recently been ordered from England by Mexican railroads.

THE Pennsylvania Railroad Co. have given an order at their Altoona shops for 40 freight locomotives to be built as rapidly as possible.

THE limited express train from New York to Boston on the New York, New Haven & Hartford road, on the night of April 11, made seven miles in five minutes and a few seconds, a speed of over 80 miles per hour.

THE Old Colony Railroad Company has just tested 46 bridges on its system. Two engines, each weighing 45 tons, were run over the structures at a speed of 25 miles per hour, and the deflection was found to be less than three-quarters of an inch.

WRITING us about inter changeability in locomotive construction, Mr. John S. Cooke, President of the Cooke Locomotive Works, says: "We make all parts of our locomotives interchangeable. By all parts we mean parts that are finished. There are some parts that are rough, and are fitted to rough parts, as some parts of tender frame work that are not thoroughly interchangeable, but can readily be made so by a little fitting. We had occasion a short time ago to send the main parts of a 10-wheel locomotive frame to a railroad to replace one that had met with an accident. It was finished complete in our shop, and when put in place hardly required the reaming of a single hole. It went together so perfectly that the parties who owned the locomotive were surprised that work could be done so accurately."

THE Standard Cast Steel Company have produced some notable castings lately by their open hearth process of production. They made a stem-piece for a U. S. Government gunboat in Cramp & Sons' yard, 26 feet long, which weighed 15,000 pounds. This was the first casting ever made for this purpose, iron forgings having always been used previously, but the inspecting engineers were very well satisfied with the casting. For the same boat there was a stern plate cast weighing 6¼ tons. They made 16 propeller blades for the U. S. navy that were subjected to a severe test. The blades were bolted to a face plate in a horizontal position, and a weight of 30,000 pounds suspended from the tip of each blade. The deflection was only $\frac{3}{16}$-inch, and it came back when the weight was removed.

MR. W. A. SCOTT, assistant superintendent of motive power of the Chicago & Northwestern Railway and president of the Western Railway Club, has been promoted to be superintendent of the Madison division of the road. Mr. Scott was for years an engineer on the Chicago & Northwestern, and was promoted from the foot-board to be enginehouse foreman and thence to the position of master mechanic at Winona. His successful shop management and quiet control of the employés under him recommended him for a higher position, and about a year ago he was selected by Mr. Tilton as assistant. Mr. Scott has been an able and popular president of the Western Railway Club. He is the second leading member promoted within a year from the mechanical to the traffic department as superintendent.

MR. C. A. SWINEFORD, for several years superintendent of the Madison division of the Chicago & Northwestern Railway, has resigned his position at the invitation of his superior officers. Mr. Swineford was a noted railroad man, very much noted in fact by those who worked under him. He was a despot and a natural tyrant, and the latter characteristic grew upon him so steadily that self-respecting men could no longer work under his charge. Mr. Swineford has gone to Alaska, where his peculiar personal traits will not shine so dazzlingly as they did at Baraboo, Wis., but he has left too many of his kind behind him in responsible positions in the railroad service of the United States. Let us hope that he will find many openings in Alaska for men of his stamp, and that he will call them there without loss of time.

THE Chicago, Milwaukee & St. Paul Railroad Company have succeeded in settling all claims for damages arising out of the Rio disaster without litigation. The claims for damage to life and property were settled for $64,617. This did not include damage to the property reputation of the road. The sum would pay for the construction and maintenance of a good many improved signals that would tend to prevent accidents of the Rio type, but we do not learn that the company is hedging in that way against future losses.

After a great many rumors respecting various probable purchasers, all the stock of the Chicago & Eastern Illinois Railroad Company has passed into the control of H. H. Porter and associates of the Chicago & Indiana Coal Company. A day or two before the final purchase of the stock by Mr. Porter, the Atchison, Topeka & Santa Fe made a traffic contract with the Chicago & Eastern Illinois for ninety-nine years, and it was widely believed that the Atchison had obtained control of the stock. The value of the C. & E. I. stock has gradually gone up, not through any manipulations of speculators, but by increase in the real value of the property. Not a small share of the prosperity that came to the company has been due to the able and economical management of the mechanical department by Mr. Allen Cooke. Of course it was highly creditable and prudent of the management to employ a master mechanic who was thoroughly competent; but it appears to us that the heads of the mechanical department of railroads upon whom falls the brunt of the battle of economy, get too little credit for the part they perform in establishing the prosperity of a railroad company. The fortunes of the C. & E. I. have been steadily rising year after year since Mr. Cooke took charge, but that result was only brought about by untiring efforts to do a great deal of work with limited facilities and by zealous solicitude to restrain every item of unnecessary expense.

Best Proportions of Draft Appliances.

As many of our master mechanics are experimenting to find the combinations of stack and nozzle best adapted for the high exhaust pipe and open stack, we give below the conclusions arrived at by D. K. Clark, forty years ago, after he had made very exhaustive experiments to ascertain the facts:

"In the same boiler, the vacuum in the smoke-box varies directly with the blast pressure. For different boilers the vacuum due to a given blast pressure varies considerably, but as a general result the vacuum in inches of water is about equal to the blast pressure in inches of mercury.

"The relation of the vacuum to the blast is not materially affected by the point at which the steam is cut off.

"The blast retains its property of exhaustion within all observed limits of speed and steam pressure, such that even at the highest speed the vacuum rises steadily with the blast.

"The exhausting power of the blast, or its efficiency in creating a draft, is largely dependent upon the form and size of the chimney and the form of the blast pipe; and that is reckoned to be the most efficient chimney which admits of the widest blast orifice.

"For a given boiler, there is but one diameter of chimney of greatest efficiency. For a greater or less diameter, the orifice must be reduced.

"The best form of blast pipe is that which projects the steam straight up the chimney. The orifice must also be truly concentric with the chimney, and it should be beveled up to the edge on the outside. The body of the blast pipe should be very wide, and should be gathered in chiefly at the nozzle.

"The smoke must have free access to the chimney either by widening the entrance with a bell-form base, and cutting out the crown of the smoke-box, or what is as good, by keeping down the blast orifice to a level below the crown of the smoke-box, equal to the diameter of the chimney or thereby, and giving the chimney a square entrance, or by a combination of both expedients. In short, the blast should be projected through the smoke and not above it. Thus a straight, vertical blast pipe is to be preferred to the double bridge pipe in common use, both on account of the superior discharge of the steam, and because it affords much less obstruction to the passage of smoke.

"Of the relative vacuums in the smoke-box and the fire-box, the latter varies from ½ to above ⅔ of the former; in other words, the resistance of the grate and the fuel to the passage of air and smoke varies from ½ to more than equal the resistance afforded by the tubes. In the boilers having the widest flue-way through the tubes and ferrules, the resistance of the tube is proportionately the lowest.

"The question of the internal proportions of boilers, without reference to the demands of the cylinders, resolves itself practically into a comparison of grate area, tube surface and blast area.

"With the same proportions of boiler, the actual dimensions within the widest observed limits make no difference in the ratio of the blast area to the grate area. It follows that the smallest of locomotives may be as favorably proportioned as the largest.

"The elements which regulate the area of blast orifice, are the grate area, the flue areas of the tubes and the ferrules, the sectional area of the chimney and the capacity of the smoke-box. The larger the grate area the wider the flue areas, the smaller the chimney, and the less the capacity of the smoke-box within observed limits, the wider also may be the blast area.

"The grate area being assumed as a standard for comparison, the elements of the boiler proper which affect the blast area are in order of importance as follows: 1. The ferrule area at fire-box. 2. The tube area. 3. The air space of grate. 4. The ferrule area at smoke-box. 5. The tube surface. The influence of the last two within practical limits is very slight.

"Of the appendages to the boiler, the smoke-box and the chimney, the latter has as much or more influence on the area of blast orifice than any other single circumstance. For it was found that a proportionally smaller chimney operated as efficiently for easing the orifice as a smaller ferrule area did in narrowing it.

"The area of the smallest observed chimney is about $\frac{1}{12}$ of the grate area, and this proportional area yields a wider orifice, under the same circumsiances, than any greater chimney area. The ratio of $\frac{1}{12}$ is therefore the best so far as observation leads us. A length of chimney of about four times the diameter is probably the greatest length necessary for developing the best action of the blast.

"The capacity of the smoke-box also affects the action of the blast. The most suitable capacity has been found to be three times in cubic measure the area of grate in square measure, or three cubic feet per foot of grate.

"In boilers of ordinary proportions, of which the ferrule area at fire-box is ⅓ of grate area or thereabouts, and the tube area about ⅔, the orifice may by the best adjustment of the fire-box, blast pipe and chimney, be made as wide as $\frac{1}{10}$ of the grate area. And in even the most unfavorably proportioned boilers, where the ferrule area may not be above $\frac{1}{10}$ of the grate, the orifice may be as wide as $\frac{1}{9}$ of the grate.

"The amount of blast area being regulated mainly if not entirely by the boiler, it is practically independent of the dimensions of the cylinder.

"Advantage being taken of the known means of perfecting the action of the blast, the orifice may in all cases be made wide enough to permit of a practically perfect exhaust when the cylinder is proportionate to the boiler. And even with extravagantly large cylinders, all the useful area of orifice may be obtained except in boilers having very small ferrule areas, $\frac{1}{10}$ of the grate or thereby.

"It follows generally that as the orifice depends so directly on the grate and the tubes, the essential advantages of a large grate and a wide tube area consist mainly in the facilities they afford for supplying a sufficiency of steam with an easy blast, a liberal orifice, heavy loads and high velocities."

Sandbagging the Railroads.

Public clamor, excited by pestilent demagogues and uneasy politicians, resulted in the enactment of the Congressional Inter-State Commerce law. One of its provisions as construed by able attorneys prohibits the railroads from granting free passes to public officials, members of Congress and State Legislatures, and other classes. The railroad companies are, as a rule, attempting to faithfully comply with the law, unwisely as it may have been enacted, and disagreeable as some of its provisions may be to themselves and others. Among other steps towards this end, one of the railroad companies has requested of a number of members of the Illinois Legislature to return their annual passes, and other railroad companies will doubtless pursue the same course.

For this act of obedience to the law, which every such man as those composing the legislatures of the various States have been demanding, a movement has been instituted and bills have been introduced at Springfield in this State to reduce passenger fares on the railroads below a reasonable or even a paying rate. This is an attempt at sandbag legislation of the most corrupt and flagrant description. The railroad corporations will do right in resisting it by all the lawful means at their command.

The law prohibits the railroads from issuing free passes. To punish them by restrictive legislation for obeying the law is a flagitious outrage on public justice. Members of the Legislature are paid for their services and for their traveling expenses between their homes and the State capital. They have no more right than any other class of citizens to free railroad transportation, and the railroads cannot legally furnish it. An attempt to compel them to issue free passes contrary to law is no better than an attempt to commit highway violence and crime.—*Chicago Evening Journal.*

Steam and Motive Power.

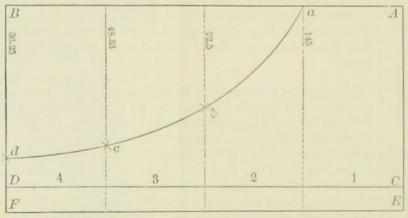
BY ANGUS SINCLAIR.

(*Continued from page 45.*)

In ordinary circumstances, the higher the temperature of steam admitted to the cylinder of a steam engine, and the lower the point at which it arrives when the exhaust occurs, the greater will be the amount of steam converted into work, and consequently the greater will be the economy of the steam engine. This law is modified by various circumstances which will be dwelt upon further on.

USING STEAM WITHOUT EXPANSION.

Suppose that by the aid of other steam in the boiler pushing it through the intervening pipes and passages, our pound of steam of 145 pounds absolute pressure enters a cylinder 16.8 × 24 inches, and, without loss of heat or pressure, pushes the piston to the end of the stroke. The whole volume of steam generated from one pound of water would just be sufficient to completely fill the cylinder at the pressure named. If our pound of steam were admitted into the cylinder under the conditions, without clearance or back pressure, and at the completion of the stroke exhausted into a perfect vacuum, a diagram of the action of the steam would be a complete rectangle as *A B E F*, Fig. 1. The height *A* would represent the pressure at the point of admission, which would be maintained until the point *B*, at the end of the stroke, was reached, when the steam would instantaneously fall to the lowest point *F*, and follow that level during the return stroke to *E*. In this case all the heat employed in raising the temperature of our pound of water and evaporating it into steam would pass out through the exhaust, except the small portion of heat energy converted into the work of overcoming internal resistance in the steam generator.



Although it is impracticable to make a cylinder receive and exhaust steam in the way described, there are many cases where steam engines are worked in a manner that approximates the case given so far as waste of steam is concerned. All engines working the steam full stroke, and consequently performing no work by the expansive power of the steam that passes through the cylinders, do their work at the expense of enormous waste of heat, and practically pass all the heat transferred from the fuel to the water out through the exhaust. The economical thermal efficiency of an engine worked in this way is about as low as it can be. The steam does its work in the cylinder by sheer pressure of the densely compressed volume crowding out of the boiler. Worked in this way, the action of steam on a piston resembles the action of water on a hydraulic ram where the water is forced against the ram by the action of the pump behind it. Or steam passing from without expansion and passing to the exhaust by the way of a cylinder, resembles a stream of water passing through a turbine, with the exception that in the latter case work is taken out of the water by reduction of its velocity, while in the case of the steam its full potentiality for work is present at the moment of its release.

HELP THAT SCIENCE HAS GIVEN THE STEAM ENGINEER.

Numerous insuperable obstacles stand in the way of admitting steam without loss or diminution of pressure into a cylinder made of conducting materials, or to exhaust it without back pressure, but to render clear certain calculations respecting the manipulation of steam, it is convenient to assume that other impracticable operations are possible. Many valuable and interesting laws, facts and figures relating to the behavior and action of steam, which the engineering world accepts as being absolutely correct, could not be demonstrated with any degree of accuracy in the ordinary practical working of the steam engine. They are the discoveries and calculations of accomplished physicists and mathematicians, who have devoted laborious and skillful special investigation to the subject aided by ingeniously designed apparatus. In studying out questions relating to heat and steam, the engineer often has to accept as implicitly as he believes the multiplication table, formulas and tables of data given in hand-books which he has no means of verifying. Facts, figures and tables about heat and steam that excite but little attention from the men daily using them are in themselves monuments of assiduous and accurate scientific labor, built up by eminent men who have devoted life-long efforts to the investigating of nature's laws. Among the physicists and mathematicians whose names are identified with the investigations bearing directly on steam engineering, are many whose existence is merely an abstraction to the ordinary engineer, yet their labors have materially lightened his work, and supplied him with data for calculations that enable him to measure heat as accurately as the armer measures his corn.

APOSTLES OF ENGINEERING SCIENCE.

More than two centuries ago, Boyle, an Irish nobleman and chemist, discovered the law that the pressure of a gas varies inversely as its volume and directly as its density, and which is yet often spoken of as Boyle's law. About the same time Mariotte, a French physicist, was investigating the same subject, and his discoveries were similar to those of Boyle, but somewhat fuller, so that the law referred to relating to gases is often called the Mariotte law. About a century ago Benjamin Thompson, Count Rumford, an American engineer, discovered and proved the immateriality of heat, and showed that heat and mechanical work are mutually convertible. Rumford's work prepared the way for the labors of Joule, an English scientist, whose wonderfully accurate and ingenious experiments and investigations resulted in the determining of the mechanical equivalent of heat.

Early in this century, Dalton, the famous English chemist, and Gay-Lussac, a noted French chemist, made some very important discoveries as regards the effects of temperature on steam. A few years later, Messrs. Fairbairn and Tate, celebrated British engineers and physicists, by calculation and experiment established the relative volumes and pressures of steam through a range of temperature suitable for the steam engineering practice of that time. The same department of research was afterwards taken up by Regnault, the famous French scientist, already referred to, and he conducted at the expense of the French government and under the auspices of the French Academy of Sciences a most exhaustive series of experiments with heat, water and steam. They were wonderfully accurate, and extended through a wide range of temperatures and pressures. That was forty years ago, and the results then ascertained still remain standard, and are regarded as models of precise physical work. The experimental inductions of Regnault relating to the densities of, or volumes occupied by, steam under different pressures, were to a great extent demonstrated mathematically to be correct by Professor Rankine, the celebrated Scotch mathematician and engineer, who also formulated numerous equations of thermo-dynamics. Of late years Chief Engineer Isherwood, of the American navy, has made many valuable discoveries respecting the action of steam in the practical operation of the steam engine, and his demonstrations of the cause and extent of cylinder condensation entitle their author to an eminent position as a physicist.

CUTTING OFF AT QUARTER STROKE.

The cylinders of a locomotive do not provide the facilities for working steam expansively that the cylinders of some engines give, but a material saving of heat and fuel can be effected if the limited possibilities are properly utilized. We may take a cylinder of the same dimensions as those given in the previous example, and work the steam expansively. Suppose we admit steam for 25 per cent. of the stroke, or 6 inches, an operation very common with locomotive work. To make the conditions of this experiment agree with those of the last one, we must ignore the effects of clearance and other disturbing elements, and assume that the steam enters the cylinder at boiler pressure, or 145 pounds absolute, during 6 inches of the stroke, and that after being cut off by the closure of the valve it expands according to the Mariotte law. The ratio of expansion in this case will be 4. That is, the steam will be expanded until at the finish of the stroke it will occupy four times the space it did when admission ended. The ratio of expansion is found by dividing the whole stroke in inches by the distance in which steam was admitted, thus 24 ÷ 6 = 4.

THE CURVE OF EXPANDING STEAM.

As the piston is pushed onward past the point of cut-off, the steam passing into the increased volume will expand according to the ordinates of a hyperbolic curve *a b c d*, Fig. 1. When the piston reaches the point *b*, the steam occupies twice its original volume, and the pressure has fallen to 72.5 pounds. When *c* is reached, the steam occupies three times its original volume and the pressure is 48.33 pounds; and when the end of the stroke *d* and point of release is reached, the steam occupies four times its original volume, and the pressure is 36.25 pounds. The actual performance would be a little different from this because there would be fall of pressure due to the steam performing the work of pushing the piston along and from other causes, but this calculation is near enough to the performance of a good locomotive doing actual service to form the basis for estimating the work an engine can do, using steam at certain pressures and ratios of expansion.

PROPORTION OF HEAT CONVERTED INTO WORK.

In our example of an engine working with steam full-stroke, the steam escaped through the exhaust practically at boiler pressure, and carried away with it nearly all the heat used by the fire in raising one pound of water to steam at 145 pounds pressure. When the steam is worked expansively, as in the last example, a portion of the heat is converted into work, and the quantity thus utilized represents the measure of economy in a steam engine. In the engine working with four volumes of expansion, the steam while doing work falls from 145 pounds to 36.25 pounds absolute pressure, and as a consequence the temperature of the steam falls from 355.6° to 260.7° Fah. According to Regnault's tables, one pound of steam of 145 pounds pressure absolute, expanded against resistance down to 32° Fah. without cylinder condensation, converts 498 heat units into work. In the case under consideration, the steam is exhausted at 36.25 pounds, and according to the same authority still contains 387 heat units that would be converted into work by expansion to 32° Fah. This indicates that 498—387=111 heat units of the steam have been converted into work by the act of expansion, and therefore that that quantity is utilized out of the total measure of heat expended.

There were 1,172 heat units expended in converting the pound of water into steam, so the economical efficiency of the work done is $\frac{111}{1172} = .093$, or a little under ten per cent. From these figures it will be perceived that with an engine working under exceptionally favorable conditions, an enormous quantity of heat is necessarily lost by passing out through the exhaust. Increasing the ratio of expansion increases the direct gain of heat, but it generally introduces indirect sources of loss that neutralize the gain, or in many instances involve loss instead of preservation of heat energy.

The steam engine cylinder, especially that of the ordinary locomotive, will not produce a diagram of pressure equal in area to that employed in the illustration with similar boiler pressure, but a good condensing engine working with steam of like pressure in cylinders of the same size will do its work with nearly an equal measure of economy. In the illustration given only one-quarter of a pound of steam is supposed to have been used, but the proportion of economy would be nearly the same as if a whole pound of steam had been used under similar conditions.

TO ESTIMATE THE MEAN PRESSURE OF EXPANDING STEAM.

The mean pressure of the steam used throughou tthe stroke in the foregoing example may be found by dividing the diagram into a number of equal ordinates, one line of which passes through the point of cut-off, and another borders the end of expansion, and taking the sum of the average pressure. The more common way is to make the calculation by the aid of hyperbolic logarithms. Find 4, the ratio of expansion on the number line in a table of hyperbolic logarithms, and take the number opposite to it, which will be 1.386. Add 1 to this number and multiply the same by the absolute steam pressure thus, 2.386 × 145 = 346. Divide this by 4, the ratio of expansion, and the product will be 86.5, the mean pressure in pounds per square inch of steam of 145 pounds absolute pressure cut-off at 25 per cent. of the stroke.

To obtain a fairly accurate average pressure the proper allowance must be made for clearance.

To make this calculation apply to a locomotive, 18 pounds at least must be deducted for back pressure. This would reduce the mean effective pressure to 68.5 pounds.

ECONOMY OF USING STEAM EXPANSIVELY.

The economy of heat resulting from using steam expansively has already been noticed. Another advantage in using steam expansively is that a greater proportion of work can be obtained from a given weight of steam. The cylinder of the engine we have been using as an illustration takes one pound of steam at each stroke, and produces an average piston pressure of 145 pounds to the square inch. To ascertain the mean effective pressure throughout the stroke, 18 pounds must be deducted for back pressure, leaving the calculation 145—18=127 pounds. With the steam cut off at 6 inches, and therefore only using one-quarter of the weight of steam employed in the full stroke example, we obtain an average mean effective pressure of 68.5 pounds. At this rate one pound of steam supplies pressure for four fillings of the cylinder or strokes, and the total work obtained therefrom is 68.5 × 4 = 274 pounds average, more than double the work obtained from one pound of steam without expansion.

The case would not come out just this way in practice, for there would be considerable cylinder condensation when the steam was used expansively, but the example will indicate approximately the result of working steam expansively.

As all engineers who wish to estimate the quantity of steam used in their cylinders under different conditions have not charge of cylinders that are self-measuring, as in the example given, it may be well to state a general rule for finding the weight of steam used in any cylinder.

Let us take a cylinder 18 inches diameter. The area of the piston is 254.47 square inches. Each inch in the stroke represented that number of cubic inches. Suppose steam is cut off at 6 inches, the quantity admitted will be 254.47 × 6 = 1,526.82, or .8835 of a cubic foot. One cubic foot of steam at 145 pounds absolute pressure weighs .3294 of a pound, so 3.294 × 8.835 = .29 pound the quantity of steam used in such a cylinder while cutting off at six inches.

This is merely an approximation, for there are several circumstances which interfere with the volume and pressure of steam admitted into a cylinder, but it is near enough the truth to find out the power likely to be developed in a cylinder of certain proportions while cutting off at a given point.

(*To be Continued.*)

Western Railway Club.

The April meeting of the club was held in the Grand Pacific Hotel, Chicago, April 20.

Secretary Sinclair called the meeting to order and proposed that in the unavoidable absence of President Scott, Mr. L. E. Johnson take the chair.

The following letter was read:

BARABOO, WIS., April 19, 1887.

I had contemplated being able to perside at your meeting this month, but by reason of an unusual pressure of business which demands my personal attention, I must forego that pleasure.

It is doubtful whether I can regularly continue my attendance hereafter and, of course, shall not be able to act longer as your president, though perhaps I had better not resign now as there will be but one or two more meetings before the annual election in September. Vice-President Cooper will probably be there to preside when I cannot be with you. Though I have left the mechanical department, you can rest certain I shall watch the action of the Western Railway Club with fraternal interest.

I think highly of the membership and have reason to believe their deliberations will produce a fruitage of great good to all concerned.

Please oblige me by stating to the club that it is with great reluctance I feel it necessary to say to them that I can no longer be depended on as a regular attendant and that they must substitute others on committee work to which I am assigned.

Yours very truly, W. A. SCOTT.

A resolution was introduced and passed empowering the other two members of the Committee on Continuous Car Heating to add a new member in the place of Mr Scott, resigned.

Mr. Crossman read the following report:

To the Western Railway Club:

The committee appointed by you last year to take steps looking to the securing of a library can not report any progress. During the first few months the illness of one member of the committee prevented any definite action. During the current year the fact that the club has had no permanent quarters, nor rooms of its own in which a library could be placed has operated against taking any action. Your committee believes that the establishment of a railway library is desirable and practicable; but believe that before any appeal for books or funds is made a place should be secured for keeping the books. They would also suggest the appointment of a new and larger committee, to include the president and secretary of the club, if it is deemed desirable to do anything further in the matter.

For the Committee,
WILLARD A. SMITH.

The report was laid over until the September meeting.

RULES OF INTERCHANGE OF CARS.

Mr. L. E. Johnson, chairman of the Committee on Rules of Interchange of Cars, read the following report, being the recommendations of change arising out of the discussions that have been carried on at the meetings of this club since September last:

Mr. President and Gentlemen of the Western Railroad Club:

Your committee appointed to recommend a revision of the code of rules governing the condition of and repairs to freight cars for the interchange of traffic respectfully submit for your consideration and further discussion the following. We find in listening to and reading the discussions that have taken place at these meetings that there is a general feeling that the rules only need changing in a few cases. There are, however, a few important matters that have come up that we propose to call your attention to, and would urge that they be fully discussed, and that the western members of the Master Car-Builders' Association go to the convention as a unit on what they decide at this meeting to be to the best interest of all concerned:

Rules Nos. 1 and 2, no change.

Rule No. 3, secs. A, B, C, D and E, no change.

Rule No. 3, sec. F, change to read: Wheels with flanges chipped.

Rule 3, sec. G and H, no change.

Rule 3, sec. I. None of your committee having had any experience with cars of over 40,000 lbs., we do not feel prepared to offer any recommendation as to the size of journals, but would suggest that members of the Master Car Builders' Association endeavor to have the present sizes increased.

For 40,000 lb. capacity cars we recommend that the limit be 3½ inches; for 30,000 lbs. or less, 3 inches.

In connection with this we call your attention to the remarks of Mr. G. W. Rhodes at the October, 1886, meeting.

Rule 3, sec. *J, K, L, M, N, O, P, Q, R* and *S*, no change.

We further recommend the addition of sec. *T* to read: Wheels with longitudinal seams on tread, 3 inches long or more.

Rule 4. A car with defects which do not render it unsafe to run must be accepted; but in such cases the company to whom such car is offered may require a buff defect card authorizing the repairs. Or the company accepting the car may attach a blue defect card recording old defects or mixed material, which shall be securely attached to the car.

Rule 5. Blue and buff defect cards shall be 3½ × 8 in., and of the form shown below. They shall be printed on both sides and shall be filled in on both sides with ink or indelible pencil.

Buff cards the same as now used.

Blue Card.
Name of road.

Car No.....Date.....
Initial.....Line.....
was received at.....by.....Railroad,
from.....Railroad,
with following old defects and mixed material.....
.....
.....
.....
obtained from
.....
Inspector.....Railroad.

NOTE.—Fill in old defects or mixed material on both sides with ink or indelible pencil. Attach this card securely to the inside cross-tin.ber. This card is not a voucher for expense of making repairs noted.

Rule 6. Any company finding a car with a buff defect card attached may make the repairs noted by the card, and, render bill for same to the company attaching card. The card to accompany bill as voucher for work done.

Rules 7, 8, 9, 10 and 11, no change.

Rule 12. Add: In case a company damaging wheels or axles, give a connecting road a defect card for the damage and the company doing the work apply new wheels and axles, full charges and credits shall be allowed as above against the company attaching the card, even though the company doing the work owns the car.

Rule 13. Add: Or shall give all the information called for on that form.

The size of bill shall be either 7 × 8½ in. or 8½ × 14 in.

Rule 14. Add the term: "Trend worn hollow and shelled out."

Rule 15. Foreign cars damaged shall be promptly repaired by the company on whose line the damage occurs. Such repairs shall be thoroughly made, and the work shall conform in detail to the original construction (provided it can be determined from the car itself) and with the same kind and quality of material originally used. New standard parts may, however, be used if agreed to.

Rule 16. Last clause to read: The wheel seats of freight axles must not be reduced more than 1-16 in. diameter to fit wheels, but the wheels should be fitted to the original sizes of axle when possible.

Rule 17. Change size of bolts from ⅝ in. to ¾ in.

Rules 18 and 19, no change.

Rule 20. Change last clause to read: The company on whose line the bodies or trucks are destroyed shall have its option whether to rebuild or settle for same.

Rule 21. Change to read: If the company on whose line the car is destroyed elects to rebuild, etc. On motion of B. K. Verbryck the original rule was substituted.

Rule 22. Add 5 per cent. to each car.

Rule 23 and 24, no change.

Rule 25. Add spring steel 4 cts.

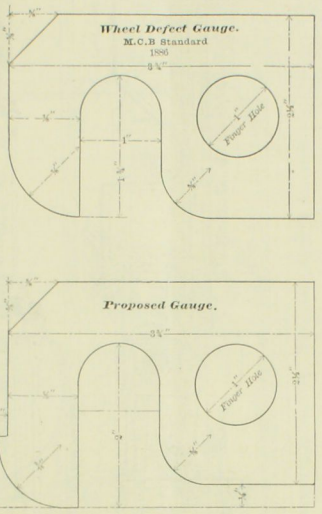
Rules 26, 27, 28, 29, no change.

Rule 30. Strike out "or in process of purchase," and add "or in process of construction."

L. E. JOHNSON,
J. N. BARR,
Committee.

The items of the report were taken up for discussion seriatim.

Under rule 3, section *b*, Mr. Mead presented a blue print from which the annexed cut is engraved, of a gauge



differing from that given in the existing rule in that it gives a definite point for the height of the vertical side of the flange when worn sharp, the leg being also lengthened ¼ inch to facilitate inserting in a tread worn close to the flange. Mr. Mead moved that his gauge be recommended for adoption by the Master Car-Builders' Association. The motion was carried.

A rather desultory discussion was carried on respecting the proposed changes in the rules, in which Messrs. B. K. Verbryck, H. S. Bryan, Allen Cooke, C. A. Schroyer, L. E. Johnson, W. H. Lewis, R. Quayle, and others participated.

Under Rule 17, Mr. Mead moved to add the words "provided that no more than two splices shall be made on the same side of bolster at either end of car." Carried.

Mr. Verbryck moved under rule 21 to strike out the recommendation of the committee and leave the rule as it stands. Carried.

Adjourned until third Wednesday in September.

New England Railroad Club.

LIGHTING OF PASSENGER CARS.

The regular monthly meeting was held on Wednesday evening, April 13, President Lauder in the chair.

Gov. Howard exhibited an illustration of the Pintsch system of lighting and described its working, the illuminating material being compressed carbureted hydrogen gas carried in a receptable of steel under the car. This gas, he claimed, would not explode in a car where there was constant ventilation. Nearly 25,000 cars, he said, are lighted by this system, and there had never been an accident from it. The cost, after a car is fitted with it, is about $12 per car per year, and its illuminating power was four times that of coal gas.

Mr. Coney said a great deal of the oil represented as 300° fire test would not show more than 225° by careful experimental test. The more the oil is refined the poorer it is for burning, because it has not the capillary attraction that the lighter oils have.

Mr. Lauder said the present methods of lighting had done good service. We could get all the light that was wanted by putting in lamps enough. The only objection was that the more lamps there were in a car the more heat. Our present system was good and economical, and it would not do to abandon it for an uncertainty. Lamps could be put in a car to burn 300° or 200° fire test oil that were just as safe as any thing else.

Mr. Wheeler said he represented a reflector system, by which reflectors were fitted for electric lighting by primary batteries. A car was getting ready for the test on the New York Central and another on the Delaware & Hudson, in each of which there were ten burners. By the use of these reflectors, he could with 12 lamps furnish 50 per cent. more light than 20 lamps would with the Julien system.

Mr. Hayes exhibited an arrangement for extinguishing oil lamps by means of a ball filled with lead, placed on the ends of the tubes so that when the car tips at any angle over 45° the ball will roll down and put out the light.

The subjects for considerating at the next meeting will be Axle Bearings, Dust Guards and Lubrication.

Committees of the Master Mechanics' Association.

The following is a list of committees and the subjects upon which reports are to be made at the twentieth annual meeting to be held in June, 1887:

1. *Proportion of Locomotive Cylinders:* To give the best results, what rule should be followed for proportioning the cylinders of an engine, when the size of driving-wheels, weight available for adhesion, and boiler steam pressure are given quantities. CHARLES BLACKWELL, Union Pacific R. R.; F. L. WANKLYN, Grand Trunk Ry.; T. E. BARNETT, Canadian Pacific Ry.

2. *Traction Increasers:* Their various types and relative merits; also, cases in which their use can be recommended. R. H. BRIGGS, Ches., Ohio, So. Western Ry.; D. O. SHAVER, Pennsylvania R. R.; T. J. HATSWELL, Flint & Pere Marquette R. R.

3. *Cross-Heads and Guide-Bars:* The various types in use, the materials and their construction, and results obtained. F. M. DEAN, Cambridgeport, Mass.; R. W. HOWSON, Cumberland & Pennsylvania R. R.; J. B. HENNEY, New York & New England R. R.

4. *Packing:* The various forms of piston packing in use, and obtained results. Also, the most economical and satisfactory packing for piston rods, valve stems, regulator and air pump stuffing boxes, with results obtained. J. W. STOKES, Ohio & Mississippi R. R.; ALLEN COOKE, Chicago & Eastern Ill. R. R.; HENRY SCHLACKS, Illinois Central R. R.

Locomotive Preparation: Washing and lighting up locomotives, showing the best system in use for washing out, and most economical and expeditious mode of raising steam in firing up, and the necessary plant for same. G. W. STEVENS, Ches. & Ohio R. R.; W. H. THOMAS, East Tenn., Va. & Geo. R. R.; T. W. GENTRY, Richmond & Danville R. R.

6. *Coaling up Locomotives:* The various plans in use, and their relative cost and efficiency. J. DAVIS BARNETT, Grand Trunk Ry.; JAMES STRODE, Northern Central Ry.; CHARLES GRAHAM, Del., Lack. & Western R. R.

7. *Standard form of Tire Section:* J. N. LAUDER, Old Colony R. R.; JACOB JOHANN, Chicago & Atlantic Ry.; H. N. SPRAGUE, Pittsburgh, Pa.

8. *What Control has the Engineer over the wear of Driving Wheel Tires?* JOHN MACKENZIE, New York, Chicago & St. Louis Ry.; J. S. GRAHAM, Lake Shore & Mich. So. Ry.; FRED. B. GRIFFITH, Del., Lack. & Western R. R.

Associate Members to Read Papers: F. B. MILES, ROBERT GRIMSHAW.

Obituary Committees: On Death of M. M. Pendleton.—C. W. Walker, Seaboard & Roanoke; J. F. Devine, Wilmington & Weldon; James McGleen, Carolina Central. On death of George E. Boyden.—J. N. Lauder, Old Colony; Geo. Richards, Boston & Providence; Jos. M. Whitlock, New Haven & Derby. On Death of S. H. Dotterer.—R. C. Blackall, Delaware & Hudson Canal; H. W. Eddy, Boston & Albany; O. Stewart, Fitchburg. On Death of J. C. McCune.—J. S. Turner, Mexican Central; H. P. Olcott, Atchison, Topeka & Santa Fe; A. H. Watts, Texas Pacific. On death of John Ivanson.—Jas. Patterson, Cin., Ind., St. Louis & Chicago; E. A. Campbell, East & West Texas; Jas. Meehan, Cin., N. Orleans & Texas.

General Supervisory Committee; Printing and "Boston Fund."—WM. WOODCOCK, JACOB JOHANN, R. H. BRIGGS, GEO. RICHARDS, J. H. SETCHEL.

Standing Committees on Subjects: T. B. TWOMBLY, Chicago, R. Island & Pacific Ry.; CHAS. BLACKWELL, Union Pacific R. R.; GEO. HACKNEY, Atch., Topeka & Santa Fe R. R.

Arrangements for Next Annual Meeting: GEO. W. CUSHING Northern Pacific R. R.; CLEM. HACKNEY, Union Pacific R. R.; R. W. BUSHNELL, Bur., C. Rapids & Northern Ry.

Committees of the Master Car-Builders' Association.

The following is a list of subjects and the committees appointed to report thereon at the annual convention to be held next month at Minneapolis:

1. *Standards and Appliances for the Safety of Trainmen:* In 1884 the committee on this subject was appointed in accordance with the following resolution: "*Resolved*, That a committee be appointed to prepare a circular calling the attention of railroad managers to the standards and the appliances for the safety of trainmen, which have been recommended by this association, and that this committee be urged to do every thing in its power to secure their adoption." At the convention held in 1885 the committee was discharged, and a resolution was passed to have a new one appointed. This committee was continued in 1886. R. HEGEWISCH, United States Rolling Co.; JOHN KIRBY, Lake Shore & Michigan Southern; M. N. FORNEY, No. 23 Murray street, New York.

2. *British and Continental Practice in Matters of Interest to the Master Car-Builders' Association:* R. H. SOULE, New York, Lake Erie & Western; WM. MCWOOD, Grand Trunk; HENRY A. WHITNEY, Intercolonial.

Automatic Freight Car Brakes: GODFREY W. RHODES, Chicago, Burlington & Quincy; GEO. HACKNEY, Atchison, Topeka & Santa Fe; B. WELCH, Central Pacific; JOHN S. LENTZ, Pennsylvania New & York Canal and R.R.; W. T. HILDRUP, Harrisburg Car Co.

4. *The Comparative Advantages of the Two Methods of Constructing Freight Cars, with and without Platform Timbers or End Sills projecting from the End of the Car:* This committee was continued, its scope enlarged, and it was empowered to submit plans giving two standards for the end floor framing of freight cars. E. B. WALL, Pittsburgh, Cincinnati & St. Louis; F. KERNBRUCK, Chicago, Rock Island & Pacific; GEO. W. CUSHING, Northern Pacific; W. H. HARRISON, Baltimore & Ohio; W. F. TURREFF, Cleveland, Col. Cin., & Ind.

5. *Maximum Outside Dimensions of Freight Cars:* JOHN P. LAVAN, Pennsylvania R. R.; C. A. SMITH, Union Tank Line; GEO. C. WATROUS, Detroit, Lansing & Northern.

6. *Standard Draw-Gear for Non-Automatic Couplers:* S. B. HAUPT, Norfolk & Western; J. N. MILEHAM, New York, Lake Erie & Western; ALLEN COOKE, Chicago & Eastern Illinois.

7. *Appliances to Prevent the Slipping of Wheels, both Passenger and Freight:* J. W. MARDEN, Fitchburg R. R.; E. W. GRIEVES, Baltimore & Ohio; W. H. DAY, Wilmington, Columbia & Augusta.

8. *Standard Freight Car Truck and Axle for Cars of 60,000 lbs. Capacity:* This committee is instructed to suggest means for having the axles made uniform in size. JOSEPH WOOD, Pennsylvania Company; H. ROBERTS, Grand Trunk & Detroit, Grand Haven & Milwaukee; M. M. MARTIN, Wabash, St. Louis & Pacific; W. A. SCOTT, Chicago & Northwestern; R. C. BLACKALL, Delaware & Hudson Canal Co.

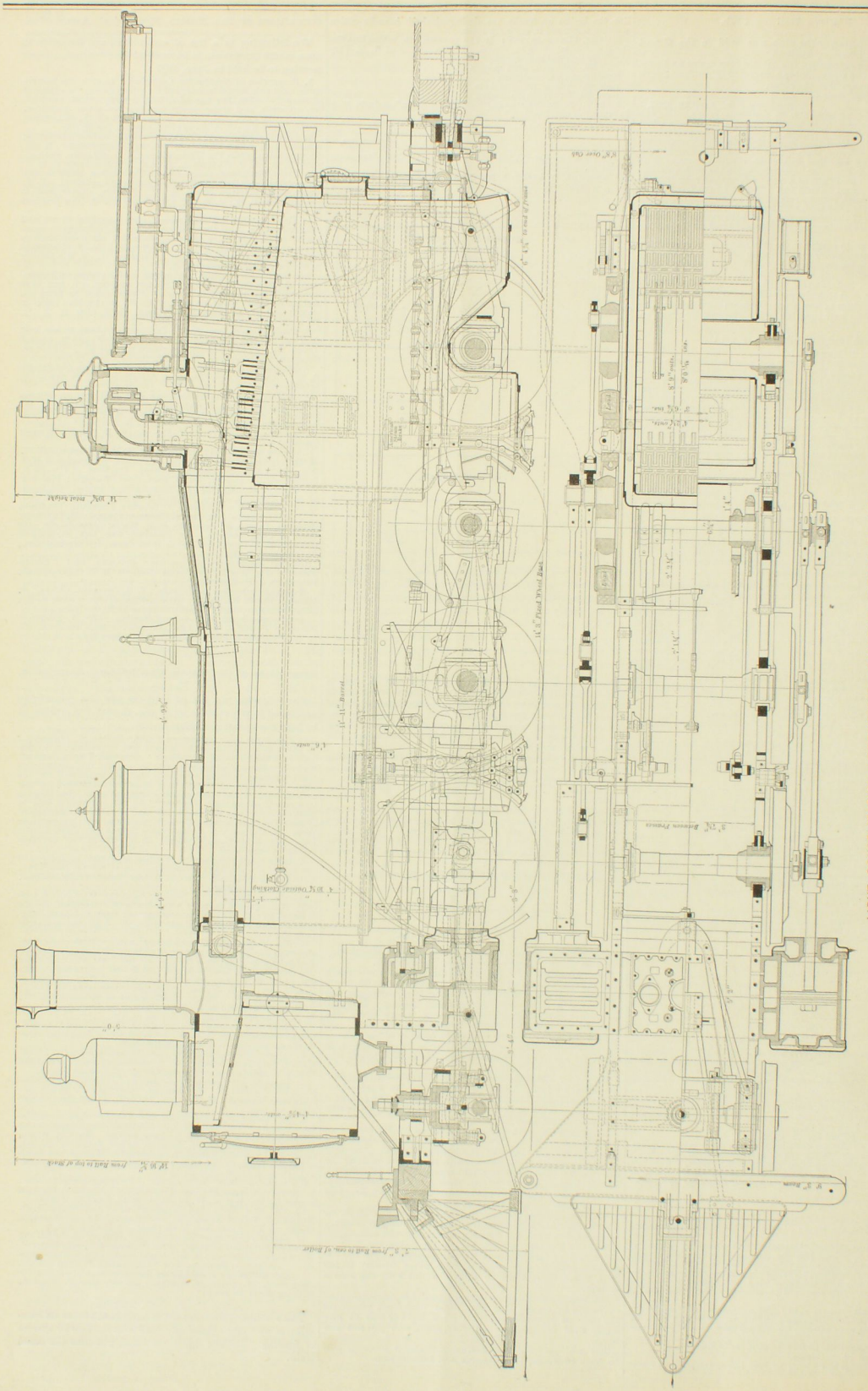
9. *Standard Sizes of Lumber for Freight Cars:* Wm. FORSYTH, Chicago, Burlington & Quincy; FRANK J. BECKER Peninsular Car Works; W. R. DAVENPORT, Erie Car Works.

10. *The Best Form and Construction of Car Roofs:* J. D. MCILWAIN, Grand Trunk Railway; SAMUEL IRWIN, Missouri, Pacific; L. PACKARD, New York Central & Hudson River.

11. *Subjects to be Reported at the next Annual Convention for Investigation and Discussion at the Succeeding Convention:* J. W. MARDEN, Fitchburg R. R.; JOHN W. CLOUD, Pennsylvania R. R.; THOMAS A. BISSELL, New York Central Sleeping Car Co.

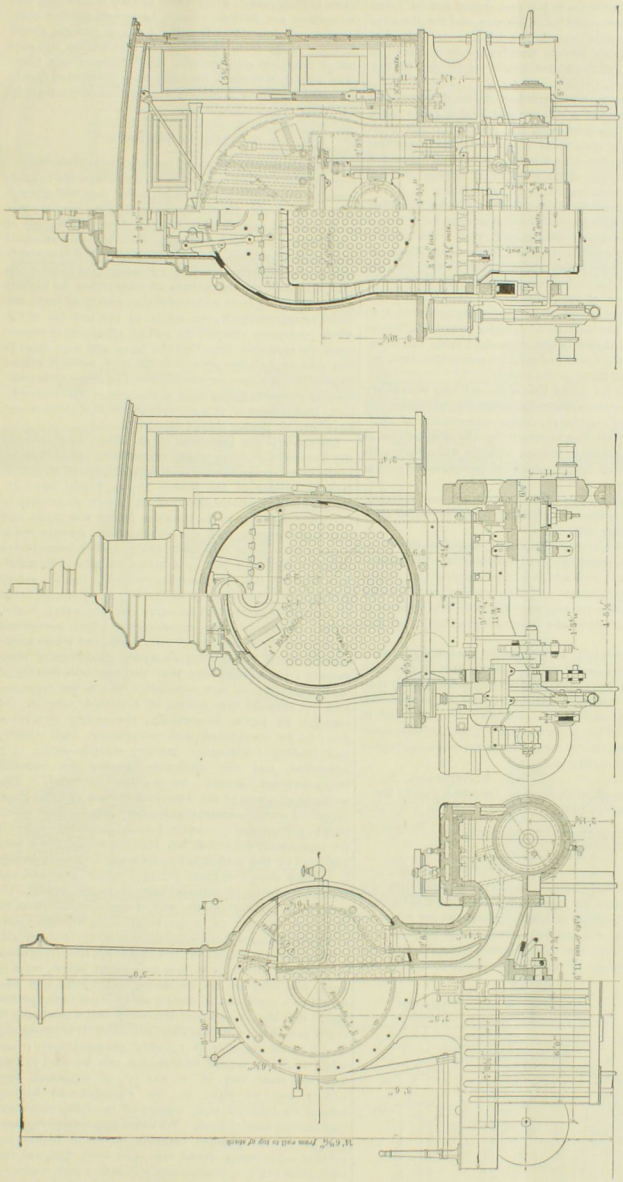
12. *Committee of Arrangements for the next Annual Convention:* GEO. W. CUSHING, Northern Pacific; GEO. F. WILSON, Minneapolis & St. Louis.

THE Fitchburg Railroad Co. is equipping two of its locomotives and eight passenger cars with the Sewall system of heating. Electric lights are being put into the same train.



LIGHT CONSOLIDATION LOCOMOTIVE—CANADIAN PACIFIC RAILWAY.

Designed and Built by E. E. Brown, Mechanical Superintendent.



LIGHT CONSOLIDATION LOCOMOTIVE—CANADIAN PACIFIC RAILWAY.

The engravings show a class of light consolidation engines designed and built by Mr. F. R. F. Brown, mechanical superintendent of the Canadian Pacific Railway, at the shops of the company in Montreal, for working heavy freight service in summer, and to operate the passenger trains in emergencies in severe winter weather.

The principal features are the short stroke, 22″, and the high boiler pressure, 160 lbs., together with the large grate surface required to maintain that pressure; also the weight of engine is sufficient to almost entirely prevent slipping the wheels in good weather without the use of sand, thus saving the wear of tires and machinery; the designer being also of opinion that a clean rail is much superior to a sanded one, though sand-boxes are provided both front and back, for emergencies in bad weather. The fixed wheel base is extremely short for the diameter of driving wheels, and the counterbalancing is carefully estimated, the result being that the engine can be run at high speeds and on curved roads with a remarkable degree of ease and steadiness.

The frames are forged solid from the back end to front of leading drivers, and the upper and lower bars of front end, which embrace the cylinders, are connected to main frame by spliced and keyed joints, not by butt ends depending on bolts for strength. Both these bars are extended to back of buffer beam, being there keyed and bolted together and to smoke box stay, the upper bar being checked on top for a heavy cross plate laid on flat, and all are rigidly secured to buffer-beam and frame by "boxed" angle irons, thus forming an efficient protection to cylinders in case of collision.

The back end of frame is secured by heavy cross bars checked for and into the upper and lower edges of frame; these carry the drag box, wedge casting and safety chains for tender, and extend outwards to support the cab back castings. The middle portions of frame are stayed entirely independent of boiler, and in such a manner as to prevent any twisting due to superincumbent weight.

The fire-box is spread over frame and is supported by four cast-steel slippers on top of frame, as the common system of four side links has given trouble by springing the sides and corners of foundation ring. Two heavy plates studded on sides of box and bent under top bar of frame, together with two heavy links connecting brackets on back face of box to frame, form sufficient security for the boiler in event of derailment, but they carry no weight and admit of free expansion of boiler.

The grate is rocked in two halves by separate handles on face sheet, and the dump can be worked easily by one hand from the foot-plate.

The ash-pan is constructed in sections so as to be easily removed without taking down any other part but the dump shaft, thus enabling any repairs to be made without taking wheels out. Both ash-pan and grate carriers are rigidly secured to foundation ring only, and not to fire-box sheets or frame in any way.

The boiler plates are all Siemens-Martin mild steel of fire-box quality, imported from Scotland, and are sheared, punched and riveted by Tweddell's hydraulic machinery, with steel rivets and stays of extra mild quality. The whole boiler, therefore, is, with the exception of foundation ring and one or two minor items, of steel of similar quality.

The valves are of the "Allen" type with Morse balancing, and the truck wheels are "Krupp" wrought-iron steel-tired disk, with Mansell clip rings and crucible steel tires. U. S. metallic packing is used for piston rods and valve stems.

The engine is capable of exerting a tractive force of 155.7 lbs. per pound pressure on piston. It is equipped with Westinghouse automatic brake to two forward pairs of drivers, and with American steam brake to two hind pairs, both systems being connected to the tender and intended to be used alternately.

Boiler, dome, cylinders, steam chests and saddle are covered with asbestos cloth ¼ in. thick. Feed water is supplied by two lifting injectors, one No. 8 on right hand and one No. 9 on left. Sight-feed lubricators are used.

The following is a list of principal dimensions:

CYLINDERS AND MOTION.

Diameter and stroke	19″ × 22″
Distance apart of centres	6′ 11″
Steam ports, length and width	18″ × 1¾″
Exhaust " " "	18″ × 3½″
Diameter of piston rods	3½″
Length of connecting rod	9′ 2″
Journal of connecting rod, length and diameter	5″ × 4½″
Travel of valve	5¾″
Throw of eccentrics	5½″
Lap of valve	1¾″

WHEELS AND FRAME.

Driving wheels, diameter	4′ 3″
" " tires, width and thickness, first and fourth	5½″ × 3″ flanged.
" " tires, width and thickness, second and third	6″ × 3″ plain.
Driving axle journals, diameter and length	7″ × 8″
Truck wheels, diameter	36″
" " tires, width and thickness	5″ × 2¼″
" axle journals, diameter and length	5″ × 8″
Fixed wheel base	14′ 3″
Total wheel base of engine	21′ 3″
Thickness of frames	2½″
Width over frames	4′ 3⅝″
" between tires	4′ 5¼″
Center of cylinder to center of driving axle	13′ 0″

BOILER.

Length of barrel	11′ 11″
Diameter of smallest course outside	4′ 6″
Thickness of plates	⅞″
" tube plates	½″
Fire-box shell, sides, thickness	⅝″
" " back and top, thickness	½″
" inside crown, thickness	⅜″
" " sides and back, thickness	⅜″
" " length	8′ 1⅛″
" " width, bottom and top	3′ 6″ and 3′ 9″
" outside, length	8′ 9″
" " width, bottom	4′ 2½″
" total depth inside, front and back	4′ 9″ and 4′ 1″
Number of tubes	208
External diameter of tubes	2″
Length between tube plates	12′ 2½″
Heating surface, tubes	1,329 sq. ft.
" " fire-box	119 "
" " total	1,448 "
Grate area	28.7 "
Weight in working order, on truck	13,100 lbs.
" " on drivers	90,900 "
" " total	104,000 "
Weight of tender, empty	35,000 "
Capacity of tender, coal	10 tons.
" " water	3,000 imp. gals.

Tender fitted with 33″ Krupp W. I. steel-tired wheels.

A Fast Run with a Common Locomotive.

Fast runs of railroad trains are quite common now-a-days, but a run that was made on the Vandalia line last month is well worthy of remark, owing to the dimensions of the locomotive which maintained the long run at exceptionally high speed. The engine was built by the Pittsburgh Locomotive Works, and is noted for free steaming, smartness and easy riding. A correspondent, writing about the run, says:

"I desire to call your attention to some facts in connection with the dimensions of the engine, as they are so completely at variance with the ideas of valve motion experts and cranks. This engine (our No. 183) has cylinders 17 × 24 inches, drivers 67 inches outside diameter, and the steam ports are 15 × 1¼ inches, valve travel 5 inches, lap outside ¾ inch, inside ⅛ inch, lead 1/16 inch. You know that they claim on some roads that ports 14×17 inches are necessary for high speed, but this run was made 166 miles in 3 hours and 20 minutes, including fourteen stops, three of them for water and one for inspection. One run of 18 miles was made in 16 minutes. Sixty-eight miles per hour is pretty good for ordinary link motion and old-fashioned unbalanced valves such as experts are trying to improve out of existence. This run was made with three cars, but three days earlier the train made the run of 166 miles between Terre Haute and East St. Louis with 3 postal, 3 express and 1 sleeper, 215 tons, in 3 hours and 36 minutes including the 14 stops, one being 4 minutes for inspection."

Proportions of Locomotive Cylinders.

In forming a basis for a discussion of this subject, the first considerations are, (1) the amount of work to be done, (2) the kind of service to be performed, and (3) the conditions of weather, etc., in which the engine is to perform the given service.

The latter of these being the most variable, and uncertain in its variations, and the power of haulage of the engine varying in a direct ratio with it, renders it necessary to enter into a full understanding of how much the power is affected.

Since (by Molesworth) the adhesion per ton (2,240 lbs.) amounts, in good weather and with dry, clean rails, to 600 lbs., while on frosty rails it falls to 200 lbs. per ton, it follows that the gross weight of train which it is possible to haul in the latter case is only ⅓ that in the former; in other words, the haulage in winter is, or may be, only ⅓, or 33 per cent., of that possible in summer, a decrease of 67 per cent.

This is also variable to some extent, being greatly decreased by hard ice on rails and in flanges, and increased by frequent passing of trains over the road, thus cleaning the rails to some extent; still, even this improvement is lost where snow is drifted rapidly across the track; however, as the whole road is, probably, never equally bad, an average loss of 50 per cent. of haulage power may be assigned for hard winter service. Of course, there are some short periods of a few days in each winter when these circumstances do not exactly hold good.

The power of an engine, other things being neglected, thus depends directly on the weight on driving wheels multiplied by a factor of adhesion dependent upon the weather, which factor becomes rapidly less in the particular kind of weather in which it is most required.

The service required is, without doubt, at its maximum in the summer for most railways, but probably the decrease in general winters does not amount to more than 25 per cent. (and is partly due to delays causing loss of traffic), and the service has to be performed with a decrease in haulage power of 50 per cent. Relatively then, the total power being equal to the service in summer, it follows that the power would be only 67 per cent. of the service required in winter.

To state the problem generally. It is found in the service of all railways more difficult to provide sufficient haulage power in winter than in summer, and this in no slight degree, though varying on different roads. The direct cause of this difficulty is that the engines "slip" to such an extent that the loads have to be diminished to suit the power, *i. e.*, to suit the adhesion, or the adhesion increased by defective means such as "double heading," which is most objectionable, and the result is the same, viz., loss of power at command by this double heading.

It is thus self-evident that the means are at hand to overcome the greater part of the trouble by increasing the adhesion to suit the requirements of winter service, *i. e.*, the engines should be designed so that the adhesion shall be more in proportion to the winter service than to that of the summer.

The next section of the subject is the principal one, that of cylinder power or proportions, when the adhesion (or weight on driving wheels), the boiler pressure, size of driving wheels, and the class of service are given. The boiler pressure most appropriate to conditions of service is a very open question, and is gradually undergoing considerable change. The size of driving wheels depends directly upon the service required. The class of service comprises freight or passenger, either local or express, and switching, and the general conditions of track on which the service has to be performed, *i. e.*, the maximum grade and its length, the longest grade and its incline, also the sharpest curve and percentage of curves to tangents, and of grades to level track. In the case of fast passenger service (which usually makes the heaviest demands upon the designer) a full description of the section of road should be given.

In designing the cylinder proportions, the first point to consider is the *piston speed*. Given the speed of the train at its maximum and the size of the driving wheel, the revolutions of the wheel should not exceed 300 per minute and the stroke should be such that the piston speed should not then exceed 1,000 to 1,050 ft. per minute, under conditions similar to those of a passenger train at 60 miles per hour; (probably 700 ft. piston speed per minute would be high enough at average speeds), even the length of stroke as above deduced may require to be decreased if extra long side-rods are required or considered desirable for other reasons. It may be accepted that it is not safe to run side-rods of flat section 9′ 0″ long at 24″ stroke, and at a speed of 60 miles per hour for general service, as the proportion of failures would be unwarranted.

Considering such a stroke to have been selected as will fulfill the above conditions, which is a mere matter of calculation, it then only remains to find such a diameter of cylinder as will develop the required energy to haul the train at the maximum speed, when cut-off occurs at a point sufficiently short to prevent any loss of speed from back pressure. As this depends greatly upon passages, etc., it may be taken for granted that if the motion is a well-designed one of the American type, the full gear cut-off being at about 21 inches (the stroke being 24 inches), that at high speeds, with full train, the cut-off will be at about 8 inches from commencement of stroke. Then the average cylinder pressure in full gear should not be more than 15 pounds below the boiler pressure, and the diameter of the cylinder should be such that this pressure will give out about 500 to 550 pounds tractive force on tread of wheel per ton (2,240 pounds) of weight on drivers, taking tires as being new.

A passenger engine with cylinders of the diameter and stroke thus found, and which can just haul a given train on a grade of 1¼ per cent. with the motion in full gear, will haul the same train at 45 miles per hour, excluding stops or for long runs, on a fair main line track having a few grades of one per cent and scattered curves up to 4° or 5°. This has been verified in actual practice.

For freight service the cylinder power should be rather less, and the tractive force at tread of wheels is sufficient at 500 pounds per ton of weight on drivers. For switching engines, 450 pounds tractive force is sufficient, as the tracks are nearly always more or less greasy, and the same holds good for regions subject to fog and mist.

Heavy sections of line, such as long grades and a frequent succession of curves, require more engine power, *i. e.*, more adhesion, but the ratio of cylinder power to adhesion should be proportionately less, dependent upon the duration of bad weather, and the cylinder power can then be higher per ton of train.

There can be no doubt that if the cylinder powers are above these allowances that considerable loss is sustained by wear of tires and machinery, and in consumption of fuel, also great dissatisfaction is caused by the diminution of service to be obtained in winter, with its attendant evils of delays, loss of traffic, abuse of power, and friction amongst officials.

Instances can be easily selected where engines designed so as to fulfill the above conditions have given results quite equal to those expected.

One point which is most frequently neglected in designing engines is to ascertain from reliable data the actual heat-value of the coal which is to be supplied; an engine cannot be designed to burn coal of fair quality, and probably fresh mined, with economy, and still in such a manner as to give satisfactory results from the scrapings of the coal heap.

It should be carefully borne in mind that though a more brilliant superficial performance can be got in fine summer weather by having rather more cylinder power than the above, still it is not so satisfactory all the year round, and is more than paid for in extra cost of repairs and in the excess of fuel burnt per ton hauled, the probable cause of which may be looked for in the increased condensation due to the larger cylinder.

R. ATKINSON,
Head Mechanical Draftsman, Canadian Pacific Ry.
MONTREAL, April, 1887.

Vestibule Cars.

The Pullman Car Company lately turned out a train of five cars intended for use on the New York & Chicago limited express, which presents a novelty in car construction. By means of a vestibule arrangement between each car the whole train can be traversed without going outside. The vestibule is an oblong tunnel occupying the

greater portion of each platform, and the really ingenious part about it is the way a weather-tight connection between the two cars is made. By the aid of our engraving the idea can be caught readily. *A A* is a steel frame kept distended by rubber springs at top and bottom When the two cars having this arrangement come together the frame is compressed, which tends to keep it air-tight, and the springs are flexible enough to permit further compression on one side when the train is passing round curves. Apart from the vestibule connections the cars are of ordinary construction. The Pullman Car Company with their wonted liberality have distributed free to the press elaborate laudatory descriptions of the train in fine, clear type-written copy.

A Lesson to Engineers.

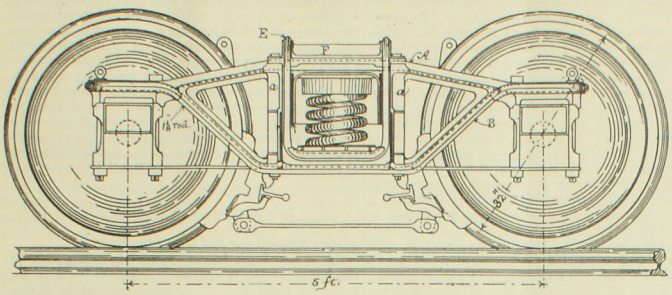
"There is one plain moral of the late Forest Hills disaster—and perhaps in the end the most important one to engineers as such—which it is to be hoped they will observe and act upon, viz., the absolute necessity for having some great national organization, like the American Society of Civil Engineers, which shall include in its membership all engineers who have shown competency for responsible charge of engineering work by retaining it for at least one year, and shall rigidly exclude all others from the highest grade. Speaking from no love for that society as such, nor desire to aggrandize it, but solely in the interest of the whole profession everywhere and of all grades of experience, we earnestly hope that the time will soon come in this country, as it has already in England, when it will be impossible for a man to earn his bread in responsible engineering positions unless he is a member of that organization. Had it been so, it is at least possible that there would have been no Bussey Bridge disaster."

The above is the beginning of an editorial published in the *Engineering News*, which proceeds to argue that the professional incompetency and inexperience of Mr. E. H. Hewins, builder of the Bussey Bridge, would have excluded him from membership of the American Society of Civil Engineers up to the time the bridge was built, and that consequently had the requirement recommended been in force, some competent bridge builder would have done the work and put up a bridge calculated to stand. We believe that engineering science, public safety and morality, would be promoted by a requirement that all engineers competent to carry out important works, should belong to some organization where recognized ability was the shibboleth of admission, and where membership would be regarded as a sure guarantee of competency; but we feel sure that the American Society of Civil Engineers, as now constituted, is not the organization to exercise this species of honorable control. To exercise its power beneficently, the society guarantee must be so constituted that competency, high ability, and leading engineering talents, should obtain easy admission, and the applicants having the opposite characteristics should be rigidly excluded. The warmest admirers of the American Society of Civil Engineers will scarcely assert that it now possesses these essentials to performing the required duties properly. There is no reasonable doubt but Mr. Hewins would have been admitted to the society before he built the Bussey Bridge if he had chosen to make the application, unless he had already made some personal enemies in the society. He could have certified, in the way of qualifications, that he had been engaged in bridge building for thirteen years, and that he designed the longest draw-bridge in the world.

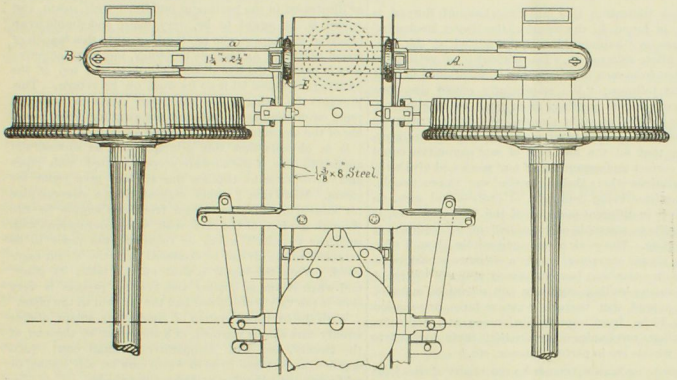
The American Society of Civil Engineers, like every other society that admits or rejects by a secret ballot, takes in some men who are no engineers, and rejects men who would be a credit to the society as they are to the profession. It is idle to say that the black-ball is used only to reject men who ought not to be admitted. It is constantly used, in all societies, to gratify personal spite; and while such an engine of injustice can be used to keep an able man out of a society of engineers, that society has no right to be regarded as 'holding within its fold all men worthy of receiving important engineering employment. We could name able engineers who have been engaged carrying on many highly important engineering works, men who have designed and built great bridges, constructed railroads where engineering skill of a high order was essential, conducted the execution of costly and imposing water-works, and been the chief engineers in such undertakings, yet they could not gain admittance into the American Society of Civil Engineers, because mean, incompetent men already in the Society, to whom they had at some time done justice, would take care to keep them out. By all means establish a society of competent civil engineers, but do not put it in the power of the sneaks to secretly strike, and without cause or explanation keep good men out.

A somewhat important suit for damages against the Illinois Central Railroad Company was recently tried in the Circuit Court at Champaign, Ill. Mrs. James Neer, the wife of a deceased engineer, sued the company for causing the death of her husband. She charged that her husband, as engineer, was ordered to run a wild train through at a high rate of speed, and was given no notice that another train was on the track several hours late. The night was dark, and Neer ran into the belated train standing at Savoy without protection. The company blamed Neer for the calamity, but the jury held that he was not responsible under the circumstances, and gave his wife a verdict for $5,000, the highest amount allowed under the statute.

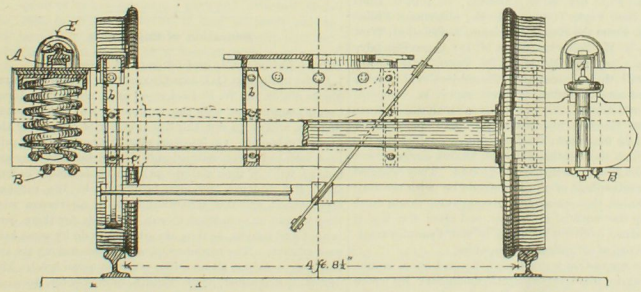
SUSEMIHL & JEWETT'S FREIGHT CAR TRUCK.



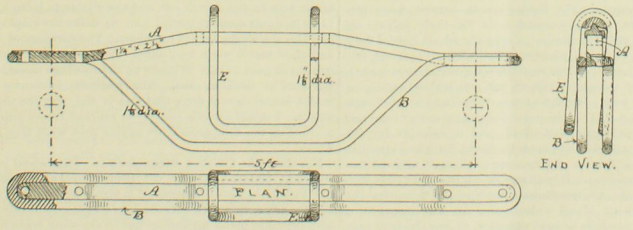
Side Elevation.



Half Plan.



Section through Bolster. End View.



Side View and Plan of Arch-Bar, Truss and Spring Stirrup, Detached.

The cuts illustrate a new freight car truck designed by Susemihl & Jewett, of Boston, Mass., and is intended to take the place of the ordinary diamond truck. Its chief peculiarity consists of a powerful side-truss *B*, made of 1¼ inch round Burden iron in the form of a link, which is bent to take the place of the inverted arch-bar and sustain the weight of the load. The only arch-bar in this construction is the upper one *A*. This is 1¼ in. thick by 2¼ in. wide. The ends over the journal-box are rounded and grooved to receive the ends of the truss, and by means of a clip about 2 in. thick placed between the bar and the box, the column bolts are relieved from shearing strain. The bolster transoms are made of two plates of steel ⅜ in. thick by 8 in. deep. In the triangular spaces on each side of the bolster, are malleable iron castings *a a*, with horizontal arms extending alongside the transoms to keep the truck square, the contiguous parts interlocking with these castings in such a way as to form a complete truss capable of sustaining the load without sagging, even if the column bolts were taken away. The bolster springs are carried in a stirrup *E* of 1⅛ in. round iron attached to a saddle *F* on the bolster, as shown. Both the stirrup and truss can be made with but one weld.

The truck may be either swing motion or rigid, the change from the former to the latter being made by substituting a rigid for a rocking saddle and removing spring seat. The center-plates and side-bearings can be adapted to car bodies of different heights by removing two bolts and putting in other castings; and the whole truck can be taken apart in a few minutes when repairs are necessary. Its entire weight will not exceed 4,800 lbs. for a car of 60,000 lbs. capacity. The tensile strength of the carrying truss and steel plates is equal to a breaking strain of 156 tons, or six times the weight carried.

In the construction of the truck body 347 lbs. of steel are used, 322 lbs. wrought iron, and 267 lbs. malleable iron, making a total of 936 lbs.

The Leslie Rotary Steam Snow Shovel.

Illustrations of this device with accompanying descriptions were given in our issues of October, 1884, and May, 1885. Since then some desirable improvements, suggested by its practical working, have been made to it, by which its effectiveness has been materially increased. It has now no independent cutting wheel in front, the cutters being attached to the fan which throws the snow. The knife-wheel which cuts the snow has also been geared slower, as its speed was greater and threw the snow further than was necessary. The machine is now reported to be capable of working its way through heavy drifts at the rate of twenty miles an hour. The main features of the shovel remain unchanged.

Blades like those of a heavy screw propeller, revolved by means of an independent engine and gearing, cut a channel in the snow and throw it either to the right or left a considerable distance from the track. The recent performance of the machine is well described in the following letter of Mr. John S. Hickey, master mechanic of the Idaho Division of the Union Pacific road:

POCATELLO, March 16, 1887.

Mr. R. Blickensderfer, Superintendent Idaho Division:

DEAR SIR: On Monday, Feb. 28, I went with rotary steam shovel up the Wood River Branch, from Shoshone to Ketchum, a distance of 69 miles. We left Shoshone at 8 A. M. and ran to Tikura, 30 miles, without finding much snow. From Tikura to end of run we encountered considerable snow, drifted into about fifteen cuts, some of them only 200 ft. long, and others 2,000 ft. As there had been no train over the road for 72 hours previous, the snow was packed and heavy. The first cut the snow was quite wet, and in places 8 ft. deep on the left rail, as we were approaching, and about 4 and 6 ft. on the right rail. We had two ten-wheeled engines, 18 by 24 in. cylinders, coupled into plow to push it through. The plow went into the first heavy drift 200 ft and stuck. The engines could not push it any farther, nor could they back out. Men shoveled the engines out, and leaving the plow in the drift backed the engines out and shoveled clear the rail. Engines were again coupled to the plow, which was again started up, though the snow at the front of the plow was as high as the top of the wheel. The plow was forced through at a speed of two miles per hour, and the cut was completely cleaned.

I consider the reason for plow sticking was a want of unanimity in signals between pilot on plow and engineers on locomotives, and they forced plow too fast into drift, thereby choking the wheel, as it could not get rid of the snow as fast as it was being forced through, as there is a limit to its capacity, and, if overdone, it will cease working. I judge from its working that day that, if given plenty of time, it will cut through a drift its own depth, at a speed not exceeding two miles per hour. After the pilot and engineers understood each other's signals, we had no difficulty, as the engines slackened their speed on approaching a heavy drift.

One locomotive engine could not have pushed the plow through that day, as the two engines were at times worked to their capacity. We reached Ketchum about 14 P. M., and left a clean rail the entire distance for the regular train to follow, which arrived 15 minutes later.

Assistant Superintendent Johnson and M. M. Hobart, of the Oregon Railway & Navigation Co., and W. T. Small, Superintendent of Machinery and Motive Power of the Northern Pacific, went along with us to observe its work and took great interest in its performance. In order to give those gentlemen a test of its qualifications, we coupled one locomotive to the plow and cleaned out a side track 1,000 ft. long at Ketchum that had been snowed under for about two weeks; snow was dry and hard, and by actual measurement taken by Mr. W. T. Small and myself was from 4 to 4½ ft. deep. It took just 3 minutes to clean this track and leave a clean rail. This ended the work for the day. The visitors seemed to be well pleased, and considered it a first-class machine for the snow service.

JOHN S. HICKEY, Division Master Mechanic.

The following are the official figures as to the mileage and the cost of running the snow shovel on the Idaho Division, and do not include some 600 miles run on the Wyoming Division:

Expenses of Running Rotary Snow Shovel February, 1887.

Rotary	Engineer's and firemen's wages	$270.20
	Fuel—58 tons	116.00
	Oil, tallow and waste	30.42
	Material	70.01—$492.63
Pusher	Engineer's and firemen's wages	184.20
	Fuel—111 tons	222.00
	Oil, tallow and waste	18.85
	Material	7.85
	Labor	65.53—$490.43
Total		$983.06
Miles run by rotary, February, 1887		2,930.2
Cost per mile		$0.16.9
Cost per mile, including pusher		0.33.5

The difference in the cost of wages on the shovel and pusher was due to the fact that a double crew was employed on the shovel, so that it could be worked day and night when needed, one crew sleeping in the caboose while the other was running the shovel. The small cost at which the road was kept clear is very remarkable. The wages of a large force of shovelers would soon exceed that amount, and the amount of work accomplished would be far smaller.

THE *Railroad Reporter*, after commenting on our recent remarks about leading railroad companies providing places of attraction to keep their trainmen from frequenting drinking saloons, feels constrained to add the following: "But the NATIONAL CAR AND LOCOMOTIVE BUILDER is evidently not well posted as to the extent of the temptation placed before the employés within the right of way of many railroads. Many men in the service have just as strong appetites for the unnecessary as the traveling public or the officials, and although every railroad now has strong rules against drinking, with heavy penalties attached, yet they allow the temptation to be placed before their men at every lunch counter and hotel along their line. The facts are the railroad companies have not done half so much to bring about the great temperance reform noticeable in the service as have the various brotherhood organizations. We want to see the boys get a little credit for the great good they have done and are doing themselves and the public."

Communications.

Experimental Tests of Railroad Material.

Editors National Car and Locomotive Builder:

In view of the recent increase in weight and power of locomotives, the heavy and fast trains they are called upon to handle, and the prospective further increase of weight and speed of trains, it is a matter of prime importance that material for the construction of rolling stock and permanent way be selected with care, and a full knowledge of the properties of railway material, and it seems a proper time to renew the suggestions that have been made from time to time for the establishment of a Bureau of Experimental Research. The prevalent idea that a long experience would enable a master mechanic or engineer to decide correctly as to the relative merits of the different materials that enter into the construction of railway equipment, and to judge of the best forms and dimensions to secure strength and durability, is losing ground. Not that experience is worth nothing, but men see from different stand-points and differ widely in their views, and their judgment is warped by prejudice and personal interest, and other influences and considerations (not forgetting "old fogyism") tend to keep men in worn-out grooves. To such men experience is no school and their employers and the public suffer from their lack of judgment, ignorance or obtuseness. It is not only the companies that employ non-progressive men that suffer from an overestimate of the advantages gained by their age and long practice, but they are regarded as eminently sound and practical by men of less experience, and they follow their lead, right or wrong, regardless of consequences. Young men, or those of comparatively limited experience, argue that as Mr. A., who has seen long service, prefers steel to iron for certain purposes, or vice versa, it must be right, and they follow suit. In this way a great deal of mischief is done by getting unsuitable material and improper forms into extensive use, to great detriment to traffic and the companies treasuries.

Years ago it was thought that by getting men together, where their views could be freely interchanged, the knotty problems would be solved, facts would come to the surface, the fittest would be selected for universal adoption, and every thing of an objectionable nature laid aside. Accordingly associations and clubs were organized, and much interest was manifested in railway progress. Strong efforts were made to get rid of the great diversity of opinions, and by using strong proofs in place of theories, to convince men of their errors, or show wherein they were at fault. Much good has resulted from these associations, much light has been shed on subjects that were in the dark, and some fog has been cleared away from some minds, but in many instances preconceived notions have held the fort in conventions against the strongest evidence, and members have gone home from conventions full of disappointment that they did not convert the whole convention to their belief against overwhelming proof that they were wrong. It is rare that subjects brought up for discussion at conventions are disposed of in accordance with the views of a majority of the members present, as, for instance, in a Master Mechanics' Convention at Boston, June, 1886, some of the members had discarded iron and adopted steel for driving axles, crank pins, etc., with good results, while others had found iron preferable to steel. Some of the advocates approved of their favorite metals without reservation, and recommended its use under all conditions, while others who were less pronounced in their views divided their opinions according to circumstances. With certain forms, steel was preferable; for other shapes, iron was best. This matter was well expressed by Mr. Angus Sinclair, at the convention referred to. He said: "In going around visiting with the master mechanics I was very much struck with the diverse opinions that existed in relation to the use of steel for axles and pins. Go to one place and the master mechanic would have nothing to do with steel at all; iron was the best in every way; he was satisfied that iron was the best. Go to another master mechanic, perhaps in the same city, with engines running very much under similar conditions, and you would find that he was just as much in favor of steel as the other man was in favor of iron. Now, in trying to investigate the subject somewhat, I came to the conclusion that Mr. Lauder has come to, that the leading objection to steel was bad forms. I think that steel is decidedly the more reliable article if the form is properly made; but, on the other hand, I think, with a bad form, it is not so reliable as iron."

Mr. Sinclair's remarks give a fair illustration of the manner in which nearly every subject is treated and disposed of at conventions, and in giving his own opinion it will be noticed that while steel is his favorite, with bad forms iron is the most reliable, so that in dividing his opinion he has given the preference to steel if tenderly cared for, but for safety in heavy weather, so to speak, he would tie to iron. It is not easy to see that if iron is superior to steel with bad forms, why it would not also be better if made of the same form as steel.

It is not a matter to wonder at that a hundred men, more or less, can rarely be brought to a unanimous verdict on questions that are usually brought before conventions of railway mechanics and engineers, when individuals are divided in their opinions, and it is for this reason that a Bureau of Experiment and Research is needed. An institution that would furnish desired knowledge on all disputed points on demand would be of incalculable benefit to the railway community. Millions of dollars have been lost to American railroads through the want of a reliable knowledge of matters pertaining to the manufacture of material and its adaptability to certain purposes, and the best forms and dimensions to secure strength and durability in railway equipment, and which knowledge can not well be gained and disseminated by men in active service through the medium of associations. Men in active railway service find their time fully occupied, and their opportunities for investigation are limited or precluded altogether. The best they can do is to occasionally jump at a conclusion. This they turn over in their minds in their post-prandial reveries until it becomes a fixed fact with them and they carry it to the convention, whence it goes out to the world in a published report in company with other and conflicting conclusions, and there the matter ends.

Another indication that an Experimental Bureau is wanted, is found in the report of the Master Mechanics' committee on "hammer blows," submitted at the convention above referred to. The difficulty of getting an expression from men in active duty is mentioned in their report as follows: "We respectfully report that your committee has held meetings from time to time extending over a period of eight months, and have written to and kept posted any absent members of our committee, in order that all the members of said committee could have a correct understanding of our work and give written suggestions where their presence was impracticable. Our committee being composed of professional men, on active duty in different portions of the United States, it was possible to assemble only one-half of its members at any one time. The work of our committee, though of a seeming simple character, was in a measure problematic, and in a direction that has occasioned much diversity of opinion among leading engineers and scientists, many of whom contend that there is no wave force, or so-called hammer blow, from imperfect balancing, etc., and some of our master mechanics maintain that their locomotive driving wheels are in perfect balance, etc."

The foregoing is an extract from the report of the joint committee, consisting of the following gentlemen: From the Franklin Institute: Prof. S. W. Robinson; Edward Longsbreth, M. E.; T. N. Ely, M. M., Altoona, Pa.; P. H. Dudldy, M. E., New York; T. Shaw, M. E., chairman, Philadelphia, Pa. From the Master Mechanics Association: Wm. Woodcock, M. M.; Coleman Sellers, M. E.; Angus Sinclair, M. E.; T. L. Chapman, M. M.; F. W. Dean, M. E., secretary. It will thus be seen that the subject was in good hands, and a careful reading of their report shows commendable industry on their part; but with all their efforts the problem remains unsolved, and they recommend special tests by machinery that they have devised for the purpose, which they estimate to cost $6,000, covered by a frame building, but exclusive of ground. They suggest that, as the advantage of any test would be with the railroad companies, that possibly these companies would unite in providing the needful apparatus, and after the test it might be turned over to the charge of the Franklin Institute for the use of all railroad companies.

The above suggestion is good, and if acted upon would open the way to more experimental machinery by which matters of importance can be decided and all controversies finally ended.

Some companies, the Pennsylvania notably, have provided means for experimental tests for their private use and placed them in charge of experts whose special duty is to test, chemically and mechanically, all matters submitted to them. In this way the company secures knowledge that is valuable to them and which they could gain in no other way. But there are matters that need thorough investigation that would require a greater outlay than any single company can well afford, and it remains for the American railroad companies to raise a fund and establish a "National Bureau of Experimental Tests" at some central point, and place it in charge of a corps of experts who would decide all questions submitted to them for the mutual benefit of all concerned. An assessment of a small sum per mile of road operated, or such basis as may be agreed upon, would furnish a building and appliances for the purposes under consideration. Those in charge of the institution would have no personal interest in the matter other than to draw their salaries and the interest that would naturally follow a desire to discharge their duties faithfully and impartially. There would be no diversity of opinions to delay important decisions to the distant future. Decisions would be immediate and final, and there would be no more groping in darkness and doubt, which is vexatious and expensive, and a due regard for safety and economy will not admit of unnecessary delays in determining what course to pursue. Such a course would relieve men in active railway service of a great deal of responsibility and anxiety, and they could perform their legitimate duties without being continually confronted with questions of a vexatious and doubtful character.

Some years ago, when this subject was first suggested, it was thought by some who had given the matter much attention, that it would be difficult to find proper men to take charge of such an institution. Since then, men have had opportunities and been trained in a manner that would render them eminently fit to conduct the most elaborate experiments, contrive special machinery and manage the minutest detail in a satisfactory manner. It is unnecessary to give a detailed description of what would be expected of a corps of experts, as their duties can be mapped out when the proper time arrives. This is merely to suggest that a move be made in the direction indicated at once.

WM. S. HUNTINGTON.

Car Heating—A New Suggestion.

Editors National Car and Locomotive Builder:

The so-called continuous system of heating cars by steam is apparently in its infancy as yet, in view of the numerous plans that are proposed for making it successful. Not the first step appears to have been taken thus far in applying to cars the true mechanical method as illustrated in the heating of buildings with steam, and which is, or ought to be, very plain and simple to all practical mechanics who are familiar with this branch of steam heating. As respects buildings, the most effective way is to carry the live steam directly to the top of the building, and then let it do its work on its return. This prevents the lifting of the condensed steam or water, a rapid circulation is secured, and the gurgling or hammering of the steam in the pipes is done away with.

It is obvious that this principle can be successfully applied to cars, if the cars are properly fitted with pipes and valves, so as to displace the air and give room for steam. To do this, I would suggest that a covered pipe for conveying the live steam from the engine be run through the tops of the cars, with valve connections with each car to admit steam as required: the pipes to be arranged so the air can be displaced and the steam regulated. When the supply is shut off, air takes its place, and when steam is applied the heating process is very slow if the valves are closed and the air held in the pipes.

With the overhead system of conducting steam, one or twenty cars can be warmed, or a single car at the end of the twenty, and with comparatively small cost. Yard engines can be piped so as to warm cars on side tracks, or while handling them in and about the yards.

E. A. OLMSTEAD.

NEW YORK, April, 1887.

Education of Enginemen.

Editors National Car and Locomotive Builder:

I read in the last CAR AND LOCOMOTIVE BUILDER the remarks which Mr. W. E. Lockwood made about the education of enginemen, and the comments which you made thereon, and I do not think that either of you cover the ground properly. Of late years the brotherhoods of railroad men have been coddled and spoiled because they are not so wild in their actions as some other trades unions are. But because the men belonging to the railroad brotherhood are not rank anarchists is no reason why they should be permitted to run the roads for their own behoof and benefit, as they are allowed to do by some railroad officers. The tendency of all trades unions always has been to reduce all men to a common mean level. The first-class machinist, or blacksmith, or carpenter, does not need to belong to a union, and the connection with a union is always an injury to him, but the slouch who does not know how to do a decent job, and never tries to learn how to do it, needs a union behind him to make the employer pay him the wages earned by others. The earnings of the first-class man's work has, under the trades union system, to be paid in part to make up the shortage caused by the work of inferior men. The warmest advocates of trades unions cannot deny that this is the way the thing works. I object for this reason to railroad trades unions preventing the companies from paying men what they are worth.

But the point I wished particularly to write about is in regard to claims raised by the Brotherhood of Locomotive Firemen. That organization is arrogating to itself the right to insist that members shall be advanced entirely by seniority, and many master mechanics are weak enough to submit to the dictation put upon them. Let us take two firemen that join a road within ten days of each other. No. 1 belongs to the numerous class that is determined to get through the world with the least possible exertion, physical or mental. He is not active enough in meanness to get discharged. When the weather is very bad and trainmen's duties are trying, he is found comfortably on the sick list, and by sagacious shamming he manages to escape all hard work. If the thing is possible, he finally plants himself down on some soft run to wait till his time for promotion comes round. In the meantime he has learned nothing that would recommend him as a man capable of taking charge of a locomotive and proving a capable engineer. No. 2 is in every way the antithesis of No. 1. From the beginning he has shown a disposition to do his best. He has taken his share of the work as it came along, doing it cheerfully. Being industrious and helpful

he has been popular with the engineers, and he has learned all his associates knew, so that he promises to become a useful engineer. As I make it a point to know the habits of my men, I understand these two men like a book. When one is wanted for promotion, I pass No. 1 and take No. 2, and the Brotherhood raises a howl, sending a deputation to teach me my duty. In my case they might save themselves the trouble, but I know several master mechanics who have not grit enough to use their own judgment in a case of this kind, and the influence of the Brotherhood is being exerted in a way that is prejudicial to sensible means of managing railroad business.

Our enginemen need to be better educated, and need it badly, but many master mechanics need educating about how to look after their own and their company's interests in their treatment of enginemen. I go in for reform of the civil service and the selection of the men best able to do the work to be paid for. As I take more interest in my own business than in politics, I believe in making sure that the best man is selected for promotion to the right-hand side of a locomotive. Every fireman waiting for promotion knows that he will have an interview with me and the trainmaster before his name goes up, and if he is not well posted his name will go downward. I find that plan is wonderfully stimulating to the industry of a fireman, but it will lead to mistakes if the habits of men are not noted. The brotherhoods are fond of mottoes. Mine is, "Let every man attend to his own business."

MOTIVE POWER.

Cylinder Counter-Pressure Brake.

Editors National Car and Locomotive Builder:

Much interest has been recently taken in securing the best methods of controlling the speed of railroad trains, and the C., B. & Q. road has shown a commendable degree of enterprise in securing accurate data in relation to these matters, which places the traveling public under special obligations for the services they have rendered in aiding the perfection of this desirable and necessary equipment. During the trials of last year much progress was made, and no doubt those contemplated for next month will enable such a finding as will largely determine which system of train braking is the most reliable, effective and economical. I had intended, had the conditions of the trial been such as I could have pecuniarily reached, to have secured a train and engine equipped with my appliances for train braking, but being unable, I must content myself with regretting I could not add my quota to those assisting in accomplishing this desirable end. I forward, by express, a blue-print of an arrangement I have had attached since June, 1885, to an engine, so that it may be fairly said to have passed beyond the domain of experiment, and has proved on several trials to be a very effective and necessarily an economical method, by virtue of the fact that the power of the train's motion alone is utilized to gather the force necessary to stop it.

The equipment is extremely simple; it consists of a slide valve to pass over the exhaust nozzle, excluding all the impurities contained in the smoke-box. Attached to the lever working this valve, is another that opens an orifice to the outer atmosphere and is carried into the cab under control of the engineer. The second part consists of two valves and a three-way cock. The valve below the three-way cock is arranged so that the engineer can control the air pressure in the steam-chests and pipes when running reversed between the maximum boiler pressure and the atmosphere. Three-way cock is intended to pass the stored air in steam-chests and pipes back to the air cylinders of the cars, and the other valve, above the three-way cock, is set at a fixed pressure, to prevent any undue strain upon the car air equipment.

JOHN HALL.
Grand Trunk Railway.

HAMILTON, Ont., April, 1887.

About the Hannibal & St. Joe.

Editors National Car and Locomotive Builder:

One of my latest rambling grounds was the locomotive and car departments of the Hannibal & St. Joe Railroad, and I saw a good many things that interested me, and which I believe would be of interest to the readers of the CAR BUILDER. I have had occasion to be round this department at intervals for a good many years, and it is not a long stretch of memory for me to remember when machinery and rolling stock looked decrepit, worn out and in poor shape and worse appearance. Now there is a great change. To me the change is closely associated with Mr. N. J. Paradise, the master mechanic, who has been constantly in front during the struggle to change the old to the new. Three years ago, when Mr. Paradise took charge, the road had 76 locomotives, and it has that number to-day, and in the meantime a good many new ones have been purchased and others built by the company, but the advent of a new engine always meant that the time had come to transfer one of the ancients to the scrap heap. Last year they had six new locomotives built at the Burlington shops, and they built five themselves, but that was not allowed to increase their grand total. The locomotives on their list are now capable of doing exceedingly heavy service. There are twenty-one engines with cylinders 18 × 24 inches, six of them being Moguls. They have two consolidations, 20 × 24 inches. They are now building, in the shops at Hannibal, five 18 × 24 standard eight-wheel engines, which will soon be ready and are needed to take the place of others that are unfit for service.

There are some boilers on this road that have been in service 32 years, and yet have no sign of a leak about them. When Mr. Paradise took charge, the first thing he did was to thoroughly brace and strengthen all the old boilers, and every one holds out admirably. Among the engines, 34 are equipped with driver brakes and air pumps, and the motive power throughout is well equipped with appliances tending to promote economy.

In the freight-car department they have been following the same kind of policy as they pursue in regard to locomotives. For some time they have been building one new car a day, but as soon as a new car is finished an old car drops out of the list. No increase or much renewal has been made among passenger cars, but a great deal of modernizing, painting or cleaning up has been going on, and the passenger equipment has quite a holiday look. The rolling stock throughout does not need to hide its head alongside of that of any neighboring road nowadays.

I see that the company are preparing to improve their road and road-bed this spring. They have already a great many new steel rails unloaded ready for putting into the track, and it is expected that a busy summer will be spent improving the property. They have done an unusual amount of business during the last season. Mr. S. E. Crance, superintendent, and Mr. N. J. Paradise, master mechanic, are quite popular, and regarded as first-class railroad men. Both are graduates of the Q.

RAMBLER.

Steam Used in Car Heating.

Editors National Car and Locomotive Builder:

In your report and comments upon car heating experiments in progress upon this road, you give an abstract of results we have obtained, and also figures for steam consumption. These latter are correct, except where you say I found it required 8½ per cent. of steam generated by the locomotive to heat a *five*-car train. The real amount of steam needed is great enough—much greater than was claimed by inventors in this line—but hardly as hopelessly so as you make it.

By taking the average steam condensation per car per hour at 10 degrees above zero (115 pounds), and granting that 6½ pounds water would be evaporated per pound of of coal (rather too favorable a figure, I presume, in most cases), we have 17¼ pounds coal per car per hour required for heating. One of our 17 × 24 cylinder engines, on level track, will haul, at the most, eleven coaches, and make time, and, taking the coal consumption and water evaporation under these conditions, I estimated it would require 8½ per cent. of the locomotive capacity for heating. This figure only applies, of course, to the particular temperature noted. We found a steady rise in steam consumption with falling temperature, but our series of tests was far from complete when cold weather failed us.

GEO. GIBBS,
Eng. of Tests, C. M. & St. P. Ry.

Locomotives Compared.

Editors National Car and Locomotive Builder:

In the April number of your paper, Mr. W. J. McCarroll questions the statement made that the "J. W. Miller," recently built by the Rhode Island Locomotive Works, was the most powerful locomotive in America, and proceeds to substantiate his objection by given dimensions of the "Delano" (66) belonging to the Lehigh Valley Railroad. I admit that the Delano is a heavier engine than the J. W. Miller, but it is steam, not weight, that enables a locomotive to pull a train, and as the latter engine carries 180 pounds with plenty of weight to keep it down, while the former carries 130 pounds, it will be found on figuring the problem out by the ordinary formula that the Miller has about one thousand pounds more tractive power to move a train than the Delano has. That is when full boiler pressure is estimated on. As the efficiency of a fast passenger locomotive depends very much on how the train is got away from a stopping point, the advantage that the Miller has comes in at the right place. This engine has ample power to force a heavy train quickly into speed, and that with a large driver, which in turn enables the engine to do her work at the very highest velocity with a comparatively low piston speed. There must also be a decided advantage in using a small cylinder, for friction and cylinder condensation cut an important figure in causing loss of power in very large cylinders. All things considered, I am ready to stand and fall by the

"MILLER."

PROVIDENCE, R. I., April 15, 1887.

Smoke Boxes.

Editors National Car and Locomotive Builder:

The first portion of the letter about Extension Smoke Boxes, by R. G. N., that appeared in your last number, was after my own heart, but when I come to the remedy he offers for the prevention of spark throwing, I had, like the Yankee traveler in Dickens' Boy at Mugby, to laugh. Your correspondent can have no idea of the intensity of heat that rages inside the fire-box of a hard-working locomotive, when he proposes to insert strainers in the flues to keep cinders from getting in. The locomotive running out of New Orleans may be so lightly worked that a strainer would last through a trip without burning out, but I am certain those in the lower flues would not stay there for ten miles in the soft coal burning locomotives running out of Pittsburgh. Another insurmountable objection to the plan of R. G. N. is that many kinds of coal deposit a silicious substance on the flue sheet, which is apt at times to choke up the flues, and would certainly make strainers solid in no time. A simpler way than using a strainer for each flue would be to put a netting over the flues in the fire-box end. Netting would certainly stand as long as a thin perforated steel plate, but it would not stand long enough to be worth trying. I am dead against extension fronts and all pertaining thereto, but this dislike does not let me become a convert to impracticable proposals. After all, has there ever been any thing more successful, all things considered, than the low double nozzles, the well adjusted petticoat pipe and the diamond stack? I still see a good many locomotives running with these things in use, and they do not cause any trouble to speak of. They get away from stations very well, they are not troublesome laying down on grades, the enginemen do not lose time excavating a six foot dump of cinders out of the smoke box, and the trucks run fairly well with the half ton less weight. On the whole, it looks to me that some of the roads hereabouts would be benefited by a retrograde movement in regard to smoke boxes and draft attachments.

PITTSBURGH ENGINEER.

Mr. G. W. Cushing Goes to the Reading.

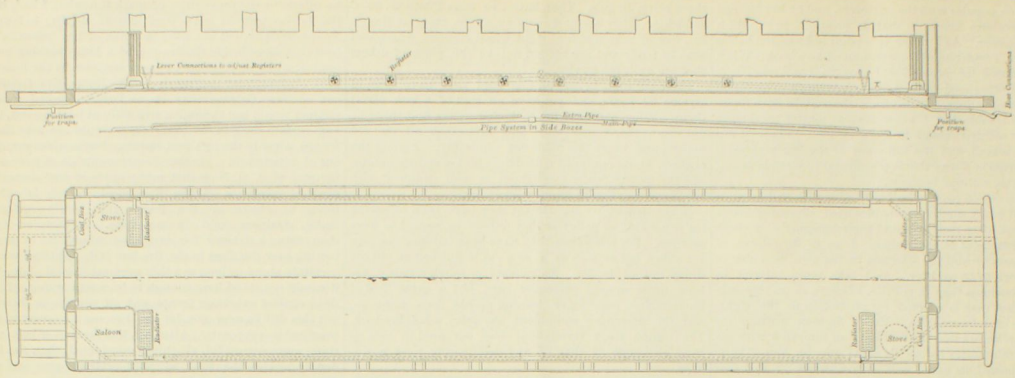
Mr. G. W. Cushing, superintendent motive power, machinery and rolling stock of the Northern Pacific Railroad, has resigned to take charge of the mechanical department of the Philadelphia & Reading Railroad. Very great inducements were offered to Mr. Cushing some time ago to prevail on him to accept the position he now takes, but he declined, and it is understood that his hard experience with the unusually severe weather of last winter on the Northern Pacific led to his accepting the offer when it was again tendered to him. His relations with the management of the Northern Pacific have always been of the most cordial kind. General Manager Oakes, in announcing Mr. Cushing's retirement, says that "his long and successful service with this company, his ripe experience and good judgment, the present efficiency of his department, as well as other considerations personal and official, render the necessity of accepting his resignation one of extreme regret. He will carry with him the esteem of his associates, attended with the earnest hope that the success enjoyed here will crown his efforts in any new field he may enter." This is a seasonable and well deserved eulogy of a retiring officer. Besides being a pleasant and genial gentleman, Mr. Cushing is a highly acccomplished mechanic and an excellent organizer. The newspaper men, who never fail to receive a pleasant answer to questions put to Mr. Cushing, may not be aware that he once belonged to their craft, but such is the case.

He began his working life by learning type setting in Boston, and when he was put in charge of a press he fell so deeply in love with machinery that he left printing and learned the machinist trade. His first railroad work was done at the White River Junction locomotive shops. He set the valves of the first locomotive built there having the link motion, and the links were hung in the center and the valves did not cut off evenly. Coming West, he entered the service of the Chicago & Northwestern Railway, and was a division master mechanic for that company for eight years, and left to take charge of the Kansas Pacific machinery. He was there only a short time, when he left to take charge of the motive power of the Northern Pacific. In 1873 he left that road and occupied in succession several important positions on different roads till 1882, when he returned to the Northern Pacific, where he remained till now. We believe the management of the Reading want to have the machinery peculiar to the road treated fairly on its own merits alone, and we are certain they could not have selected a man less likely than Mr. Cushing to be affected by prejudice.

Master Car-Builders' Club.

The regular monthly meeting was held on Thursday evening, April 21, the President, Mr. C. E. Garey, in the chair. The subjects discussed were the heating, lighting and ventilating. The merits of sundry devices were set forth by the parties interested in securing for them the favorable attention of railroads, but as the discussion developed nothing particularly new, we omit a detailed report.

THE Baltimore & Ohio has commenced work on its new passenger depot in Pittsburgh. It will take till November, 1888, to complete it.



SYSTEM OF CONTINUOUS HEATING FOR CARS OF NORTHERN PACIFIC RAILROAD.

The work which the Northern Pacific Railroad Co. are doing towards developing a safe method of heating cars has excited widespread attention, for it is generally conceded that a system which shall be successfully applied on the Northern Pacific road, traversing as it does some of the coldest regions of the country, will be applicable to any part of America. Most of our readers are aware that the Northern Pacific are building a car to carry the means of heating the train by steam and of lighting by electricity This car will be, to a certain extent, experimental, and upon its success in service will depend the future action of the company in respect to heating their cars. They expect by this means to determine how far a system of continuous heating can be applied to railroad cars in a cold region during the coldest weather. The above engraving shows the system of pipes for steam heating which Mr. G. W. Cushing designed for the experimental train. As will be seen, radiators are used not unlike those employed in ordinary house heating. The piping arrangement may be modified as experience dictates. The intention is to use this system in connection with the heating car, or with the supply of steam from the locomotive, which will be tried for short train service.

The Northern Pacific will use the pipe coupler connection and the trap for pipe drainage which may be found by experience best adapted for the work, the company being willing to pay royalty for patented devices of this kind, but reserving the privilege of choosing the most suitable. The arrangement of radiators and pipes is so clear in the engraving that no description is necessary. Is seems to us a simple and convenient method of arranging for the radiation of heat inside a car.

Young Car Heating Apparatus.

A few miles from St. Paul, at Hudson, the headquarters of the car department of the Chicago, St. Paul, Minneapolis & Omaha Railway, I recently witnessed some interesting tests of the Young car heating apparatus. The device is applied to a passenger car belonging to the road named, and embraces an ingeniously developed method of producing heat by the combustion of gasoline or other hydro-carbon compound to be used for heating cars. The process entails the converting of the liquid fuel into gas, which is used for lighting as well as for heating purposes. The principal object of the invention is stated to be to provide an apparatus by which cars and other structures where it is used may be kept at any required degree of heat in any climate, and thereby rendered comfortable and enjoyable, and in case of accident or collision when human life is endangered or the destruction of property made probable, the production of the heat will be instantly cut off, the supply of fuel removed, the light, if any, extinguished, and all danger by burning and consequent loss of life and property prevented. It might appear on the first instant of reflection that to employ a highly inflammable material like gasoline for car heating purposes would be to increase the probabilities of conflagration in case of collision or other serious accidents, but this apparatus is so devised that the chances of the liquid fuel setting fire to the car would be very small. In the test at Hudson, the Young apparatus was used in connection with a Baker heater. The gentlemen exhibiting the invention claim that they can heat the whole water in the coil and pipes of a Baker heater up to the boiling point, and have it circulated round the whole car in half an hour. The apparatus certainly showed great heating power.

The gasoline is carried in a small, strong copper tank on the outside of the car roof, and so secured that in case of collision it would be knocked off and thrown away from the wreck. By means of pipe connections the gasoline is led to a gas generator, and thence to a circular burner so set that the flame impinges upon a hollow diaphragm, through which the water circulates. A noticeable feature about the working of the apparatus was the large proportion of the heat generated that was transferred to the water. The whole thing was inclosed in a neat case about half the size of the ordinary car stove. A ball like a governor ball, attached to a lever, rests on a holder like a saucer. If the car receives any particularly violent shock this ball is thrown out of the rest and its movement operates the mechanism for extinguishing fire and lights.

The test was watched by a number of leading railroad officers, and the working of the apparatus made a very good impression. Very few of the railroad officers in the neighborhood of St. Paul put any confidence in the proposals to heat cars with steam by the continuous system. The separate hot water systems are most popular there, and railroad men say the real want is a safe and cheap means of heating the water. A. S.

A New Car Coupler.

Messrs. Baker & Prescott, of the Delaware, Lackawanna & Western car shops, at Dover, N. J., are the inventors of a new automatic car coupler, to which has recently been added an automatic link controller, by means of which the link can be set to enter any height of draw-bar, the adjustment being entirely automatic. The gravity dog lock, which works on an incline of 45 degrees, is so governed by a spring that the link is held in whatever position it may be placed, but not so rigidly that it cannot be easily moved to any position required, leaving it so free in fact that in coupling it will be governed in its movement by any thing coming against it, without breaking the link. The link is also left free to guide itself in going around curves. This entirely obviates the danger of setting the link by hand, and leaves no possible chance for injury in coupling under any circumstances, as the brakeman has only to set the link, step aside and let the automatic coupler complete the work by the contact of the cars. The best link controller heretofore introduced has required a man to handle it. But this one is adapted to every possible make of car and draw-bar, and particularly to cars of such peculiar construction as to have but a very small space for the link to enter, so that no revolution in car building will be required to make the use of the automatic coupler universal. The completed device has been applied to all the different builds of cars known in the yards, and works to perfection. It furnishes more room between the cars than any other device known, being set so far back that it leaves as much space between the cars as there was before the draw-bars and couplers were attached. For flat cars it is the only device in which some part of the attachment does not come above the floor when the pin is up. It can also be set so as to cut off or not couple, without the brakeman being near the link or in any danger whatever. The whole attachment is so simple in construction that it can be taken apart and put together in two minutes. At the request of the Eastern Railroad Association, the inventors have just completed a full-sized model of their automatic coupler and link controller, which is to be placed in the rooms of the association in New York city.—*Iron Era.*

A Passenger Train Warmed and Lighted Without Fire.

The New York & Boston limited express, via Springfield, composed of two drawing-room cars, two passenger coaches and a smoker, embodies some decidedly new and desirable features that can not fail to prove highly acceptable to the traveling public. The cars are not only heated with steam from the locomotive and lighted by electricity, but all of them have Roman arch-roofs instead of the usual raised or monitor roofs. The steam heating is what is widely known as the Martin system, which had made for itself an excellent record on the Boston & Albany road, and elsewhere. The electricity for lighting is supplied by Julien storage batteries attached to each car, and each car has 16 incandescent lamps of 16 candle-power placed in a double row along the ceiling. There is also an electric light in each saloon and over each platform. The inside finish of the cars is in solid mahogany throughout, and quite devoid of ornament. The absence of the raised roof rather adds to the plainness, and if the lighting was by the ordinary oil lamps, the effect would be a little too somber. The electric lights, however, counteract this effect to a great extent and give to the spacious interior a brilliant and imposing appearance.

The span of the roof resembles a low or flattened arch, the hight of the central portion being the same as that of the ordinary raised or deck roof, the sides uniting by a graceful curve with the car wall. The entire ceiling or arch is uniform in color and material with the rest of the interior, and resembles a mass of closely joined small panels. The roof is double, and two rows of ventilators are placed along the center of the ceiling, through which the air is exhausted into the intermediate space between the upper and lower portions of the roof. The details of the construction of the arch are so hidden that they are not apparent to the eye, and can only be understood by drawings or by seeing them put together in the erecting shop.

The drawing room cars have 24 pivoted arm-chairs in each, upholstered in old-gold plush, and there are also sofa seats for 12 more persons. The coaches and smoker seat 68 persons each. There are 18 windows on a side, with 33 × 22 inch plate glass and roller curtains. Thecars run on 4 wheel trucks with 42 and 36-inch wheels.

These cars, in the prime essentials of heating and lighting, are a notable innovation upon the old methods that have so long been adhered to. They are a progressive step which promises greater safety and more comfortable accommodation than the occupants of passenger cars have hitherto enjoyed, and it is to be hoped that the step will not have to be retraced. The change in the style of roof construction is to a great extent a matter of taste, which may or may not be justified on the score of actual utility. But the electric lighting and steam heating, unless they are yet too much in the experimental stage and subject to unforeseen drawbacks in their practical working, will rapidly take the place of the objectionable lamps and stoves with which passenger cars have so long been encumbered.

Wonderful Escape from Wreck.

The unusually large number of fatal railroad accidents which have occurred of late serve to give a new interest to all devices and appliances designed to avert catastrophes of this nature. The problem of quickly controlling a freight train which is under great headway is one which has been left by a majority of roads without solution, and in many parts of the country the only agency which is relied upon to avert those frightful wrecks which are so liable to befall heavy freight trains on steep grades, is the old hand or twist brake. The following communication, which appeared in the Albany *Evening Journal* a few days ago, is very interesting in this connection :

MESSRS. EDITORS.—In common with a great number of our brotherhood, I am pleased to see the rapid introduction of power brakes for locomotives, and how generally they are now coming into use. I have had an improved form of steam brake upon the engine which I am running now for several months, and have already had several opportunities of observing its usefulness. I will relate one instance which happened to me quite lately, and which will illustrate the advantage of such a device upon the engine. A short time ago I was coming down the mountain with my engine light and I saved a runaway with the brakes on my engine in this manner : A train, of engine and 75 cars, was following me, and their hand brakes could not hold the train, when the engineer reversed the engine and blew both of his steam-chests off. I saw the situation and prepared to see what virtue there was in my steam driver and tender brake, so I governed the speed of my engine until they came against me, when I stopped the whole outfit in a very short distance with my steam-brakes, in time to save running into another train ahead of me, and thus averted what might have resulted in a terrible smash up all around. I believe that all engines upon the roads should be provided with effective power brakes, especially these heavy mogul and consolidation engines which are coming into such general use.

JAMES HILBERT, Division 263.

The Burlington Brake Tests.

The Committee of the Master Car-Builders' Association on Freight Train Brakes have issued the following circular:

AURORA, Ill., March 31, 1887.

"Up to date, the following brake companies have notified the committee that they have made arrangements for cars and engines, and will be present at the Burlington brake tests, commencing May 9: Eames Vacuum Brake Co., Boston, Mass.; Carpenter Brake Co., Berlin, Germany; Westinghouse Air Brake Co., Pittsburgh, Pa.; Card Electric Brake Co., Cincinnati, Ohio; American Brake Co., St. Louis, Mo.; Hanscom Brake Co., San Francisco, Cal. The Parke Electric Brake Co., of Chicago, Ill., and the Rote Brake Co., of Mansfield, Ohio, have their brakes ready, but have not yet succeeded in arranging for cars. The committee will not debar them or any other company from the tests, providing they get their cars to Burlington by May 9, 1887."

"The Boyer speed recorder will be used in the dynamometer car at the coming brake trials. It is important that the engines be fitted with the same recording apparatus, and each competitor is requested to so equip the engine to be used by his company. The recorders are made by Mr. Jos. Bower, Dixon street, near Fourth, St. Louis, Mo."

"During the brake trials, in order to obtain an accurate record from the middle car, the recording mechanism will be attached to a pair of 33-in. steel-tired wheels; one pair will be furnished by the committee to each competitor, accurately turned to the same diameter. In order that the wheels may be mounted on axles that will fit the trucks, each competitor is requested to forward at once a drawing of the axle that will be used under his cars. Drawings of the flooring of the cars, with the brakes attached, showing the levers and connections, spacing of sills, cross-ties and transoms, are also requested to enable the committee to make complete arrangements for fitting up the middle car recording apparatus prior to the trials."

The Late Horatio G. Brooks.

On April 19, Horatio G. Brooks, president of the Brooks Locomotive Works, Dunkirk, N. Y., was stricken with apoplexy and on the following day he died. Mr. Brooks held a most conspicuous place among railroad mechanical men for high ability in his business, his warm heart and genial nature insured abiding friends among all classes he met, and his deeds of benevolence, though unostentatious, were so generous and profuse that few men will be more sadly missed. We do not know of a single mechanical man in the country who has made so many warm and devoted friends as Mr. Brooks, and we do not know of any one whose loss is likely to be more universally mourned.

Horatio G. Brooks was born at Portsmouth, N. H. October 30, 1828, so that he was a little over 58 years of age when taken away, carried off in the glory of his full manhood. From early boyhood he manifested a strong inclination towards mechanical pursuits, and at sixteen years of age he was apprenticed to Isaac & Seth Adams, printing press manufacturers at South Boston, Mass., to learn the machinist trade. Like many other young men, he was strongly attracted towards railroad machinery, and in 1846 he went to work at his trade in the Boston & Maine Railroad repair shops at Andover, Mass. Two years later he got out on the road as fireman, and in another year was promoted to the right-hand side. Even at that early day machinist engineers were in request for higher employment connected with the business, and in 1850, when only twenty-two years of age, Mr. Brooks was engaged to take charge of a locomotive built by Hinkley & Drury, of Boston, for the Erie Railroad. His duty was to see the engine safely transported from Boston to Dunkirk, get it put upon the track, put the parts together and transfer to the company the machine in good working order. The method of transport included land, canal and lake carriage. After getting the engine at work satisfactorily Mr. Brooks decided to remain with the Erie, and he went running on the road. He continued at that work for six years, when in 1856 he was offered and accepted the position of master mechanic of the Ohio & Mississippi. Here he was first associated with Mr. J. H. Setchel, and the intimacy continued through the rest of his life. After three and a half years profitably spent on the Ohio & Mississippi, Mr. Brooks was offered strong inducements to return to the Erie as master mechanic, with charge of the large shops at Dunkirk. He accepted, and in rapid succession was promoted to the position of superintendent of the Western divisions and then to that of general superintendent of motive power of the whole road. The original intention of the Erie Railroad Company was to establish their main mechanical headquarters at Dunkirk, as that was expected to be the principal terminus of the road, and expensive shops were put up for doing the work. But events happened which made Buffalo the principal terminus, and this led to the determination to close up the Dunkirk shops entirely. The act was going to be a severe blow to the material interests of Dunkirk, and Mr. Brooks made proposals to the company to lease him the shops, to be used as a locomotive building establishment and the propositions were accepted. That was in 1869, and the Brooks Locomotive Works began their work of engine building. The capacity at first was only one locomotive per month, but the facilities were gradually increased till the capacity is now over 100 a year.

As a manufacturer of locomotives Mr. Brooks was enterprising, liberal, far seeing and intensely interested in maintaining the good name of his productions. Every real improvement made on the locomotive in the last thirty years found in Mr. Brooks a warm advocate. When the change in methods of doing work was carried out that led to manufacturing by system instead of building up each individual engine, the introduction of expensive templates, gauges and jigs necessary to reproduce each part on an interchangeable basis found a strong and consistant supporter in Mr. Brooks. For many years he was a leading power in the Master Mechanics' Association, taking an active part in the business and discussions, and the progressive spirit of the man is strongly marked in all the speeches he made and in all the reports he inspired.

Mr. Brooks took a very warm interest in the prosperity of his employés, especially the young men. The system he established for training apprentices in the higher branches of their business is a monument more enduring than granite or marble.

In 1851, a year after he first landed in Dunkirk, Mr. Brooks was married to Miss Julia A. Haggett, of Maine. She and two daughters remain the chief mourners for a devoted husband and father.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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BY

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock, construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

Motive Power Accounts.

There is a lamentable lack of uniformity in the way that motive power accounts are kept among the different roads throughout the country, and in the methods followed to estimate the items that go to make up the performance sheets of locomotives. At the best, the common way of showing the cost per train mile for repairs, wages, etc., is a most unsatisfactory and deceptive way of estimating work done and expense incurred, for in some hands the whole thing is a delusion and a snare, and the figures produced are used to prove what is not correct. The system offers too great temptation for sophistication of accounts, and under it some of our best managed roads, and those showing the smallest proportion of operating expenses to gross receipts are made to appear very expensively run so far as cost of handling, running and repairing of locomotives is concerned, and, on the other hand, roads that have a notoriously large proportion of earnings swallowed up by operating expenses make the showing that their locomotive department is managed with exemplary economy. There are undoubtedly cases where this apparent paradox is susceptible of explanation and where a well-managed locomotive department is buoying up the weight of other expenditures, but this is hardly the normal condition of cases where the percentage of operating expenses is away above the average.

On analyzing the destination of all expenditures as given in the annual reports of numerous railroads, we lately have been very much struck and surprised at the remarkable conflict of testimony between the performance sheets and the annual reports. One railroad, whose monthly performance sheets give the highest cost per train mile of any road in the same region, has the lowest percentage of locomotive expenses to the whole operating expenses; and the road that makes the best record according to the mileage sheets is away up above all its neighbors in the percentage of locomotive to all other operating expenses. The locomotive management may not be to blame for the latter indifferent showing, but it appears an anomaly to make a good apparent record and a bad real one. All master mechanics who have given the subject of motive power accounts any consideration whatever are perfectly aware of how their departments may be made to show a good record when the real one is indifferent. Where it is the practice to charge certain repairs to an accident account, it is very easy getting an old locomotive rebuilt occasionally without any charge being made against the motive power maintenance account. In some cases, switching and construction engines perform an astonishing share of the total mileage. Again, one road may have very heavy locomotives, that take extremely long and heavy freight trains, so that the cost per train mile is high, but the cost per mile ton very low in comparison to that of the neighboring road which uses light locomotives and consequently makes small trains.

Something ought to be done by the Master Mechanics' Association to put the record of work done by locomotives on a fair and intelligible basis. On examining an admirable system of motive power accounts schemed out by Mr. Jacob Johann, we find that switching engines are credited with no mileage, and the pay roll in conjunction with the actual mileage is taken as the basis for calculating the expense of repairs, maintenance and running. Mr. William Wilson, of the Chicago, Alton & St. Louis, follows a similar system and makes an admirable real record, although the performance sheet record is inferior to that of many of his neighbors. There may be some serious objection to this plan, but we do not happen to see it, for it appears to be the fairest way for all concerned. Calculating the work done on a basis of tons moved per mile, or foot-tons, would be more nearly accurate, but it is easy to perceive serious obstacles to the introduction of such a system.

The Minneapolis Convention of the Master Car-Builders' Association.

The list of committees of this association, which we print on another page, indicates that the convention to be held next month at Minneapolis will be as prolific in discussion as any preceding convention of recent years, whatever may be the outcome as to the settling of pending problems now under investigation. If the committees present reports, as they are expected to do, embodying the results of diligent and careful research, the information furnished will be important and valuable. Since the last annual meeting three subjects have been disposed of by the adoption of standards by letter-ballot, viz.: dead-blocks, wheel tread and flange, and brake-shoe. The proposed standard height of draw-bars for passenger cars 34½ in.) and standard truck for freight cars of 40,000 lbs. capacity, have been rejected by letter-ballot. It is very doubtful under the circumstances whether any further action will be taken this year upon either of these last-named subjects. They may, in fact, be considered as virtually laid on the shelf.

In regard to automatic couplers, the Executive Committee in its last year's report recommended seven of the twelve couplers tested at Buffalo as being most worthy of further trial, viz.: The McKeen, Marks, Archer, Ames, Janney, Thurmond and Dowling. The committee was authorized to continue in the meantime to investigate such new couplers as may be recommended for trial by five members of the association, and that will couple automatically with one or the other of the four types included in the seven. [During the discussion of the report a motion was made and carried to instruct the committee to recommend the Cowell coupling to the Detroit, Lansing & Northern road for testing.] The committee is expected to report the result of its investigations at the annual meeting next month. It will not be a matter of much importance, however, as any action of the Car-Builders' Association has ceased to have a controlling influence in the solution of the coupler problem.

The subject of car heating will be certain to receive a good deal of attention at the convention. There is no committee to make a report upon it, but the occurrences of the past winter have made it a thoroughly live topic to be taken up and discussed, not in the languid, stereotyped kind of way that it has been in past years, but in the light of an experience which demands a radical change in the methods heretofore in use. A multitude of new or rejuvenated devices will be represented in the lobby, and their respective claims set forth with the pertinacious persistency of self-interest. A general exchange of views by the members of the association will have the effect of detecting what is wrong in theory and confirming what is right, so far as such views are based upon a practical trial of different methods and devices. We do not look for any decided action, however, in favor of any particular plan, and it may be that the whole matter, so far as the association is concerned, will be left to drift, like the couplers, towards the survival of the fittest. Laws may be enacted making the use of this or that plan compulsory, but the general run of law-makers are just as likely to make mistakes as capable and experienced railroad men.

Automatic Freight Car Brakes.—The committee on this subject made no formal report last year, in view of the trial tests that were to be made at Burlington in July. The endurance tests which were to follow were abandoned, and a new series of tests arranged to take place at Burlington, May 9, this year, to be followed by endurance tests. As these preliminary tests, which will begin in a few days, will be made under much better and more satisfactory conditions than those of last year, the results will be more important and more eagerly looked for. It is doubtful, however, whether the committee will be able to prepare anything more than an informal report of the general results in time for the June meeting of the association.

Safety Appliances for Trainmen.—There has been a standing committee on this subject since 1878. At the convention in Chicago in 1879, the committee made a lengthy report, accompanied with a number of specific recommendations in reference to draw-bars, dead-blocks, the location of steps and ladders, length and width of running-boards, fastening of pawls and ratchet-wheels, etc., all of which were duly considered and adopted. The subject of couplers, which was then "in its infancy," was impliedly included in the category of safety appliances, but it was very properly ignored by the committee. Since the above date, the committee has been continued from year to year, and reports have been regularly called for at had been made by the committee or adopted by the asso-

ciation. As no further reports could be got from the committee, except nominal ones referring to its report in 1879, it was requested, in 1883, to issue circulars calling the attention of managers and superintendents to the recommendations which had been made four years previously. No circulars were issued, however, and no reports made during the next three years, the railroad clubs and newspapers continuing to clamor in the meantime as loudly as ever for protection to trainmen, as if everything had not been done that could be done, on paper, to afford such protection. The committee is still on, and will be called upon next month as usual for a report.

British and Continental Practice.—This committee was appointed in 1885 to inquire into the practice of foreign roads in matters of interest to the association. No report was made last year and the committee after being reinforced by two additional members, was continued. The scope of the inquiry covers a wide field, which, if properly worked, would afford material for an exceedingly interesting report; but the trouble is that the members of the committee have neither the time nor the necessary facilities for doing the work as thoroughly as it should be done.

Slipping of Wheels of Passenger and Freight Cars.—The committee on this subject made an interesting report last year in reference to the merits of sundry appliances designed to remedy the evil, but without any definite or reliable results. A new committee was appointed to continue the investigation and report this year.

Freight Cars, with or without End Platforms.—A very full and elaborate report was made on this subject in 1885, but as the association was at that time unable to agree upon a standard of construction that would either retain or do away with end platforms, the committee was last year enlarged and empowered to submit plans this year for two standards for the end floor-framing of freight cars.

Maximum Outside Dimensions of Freight Cars.—This committee was appointed in 1885, but made no report last year. A new chairman was appointed, and the committee continued. We hope a report will be forthcoming this year, as we are curious to see where the committee will fix the limit for outside dimensions, or whether any limit at all will be proposed.

Standard Sizes of Lumber for Freight Cars.—This is a new committee, and the subject is an important one. The great diversity in the sizes of sills prevents their being sawed beforehand and kept in stock at the mills for quick delivery. At present, nobody knows what is wanted until the specifications are given out. Every size has to be sawed to order, which increases the cost of sills and cars. It would seem practicable that certain specified sizes for classes of cars could be kept in stock to a greater extent than they now are. The large experience of the gentlemen composing the committee justifies us in expecting an interesting report.

The remaining subjects in the hands of committees include a Standard Truck and Axle for 60,000-lb. Freight Cars, Standard Draw Gear for Non-Automatic Couplers, and the Best Form and Construction of Car Roofs. The annual revision of the Rules of Interchange will receive the attention which their increasing importance demands. The great amount of labor performed by the Executive Committee in amending and codifying the rules as reported last year, with the necessary alterations that have to be made from year to year, ought ultimately to bring the code to such a degree of perfection that all roads can abide by it without serious protest.

The Lighting of Passenger Cars.

The time seems to be near at hand when the poor lighting of passenger cars will cease to be a subject of complaint. Public sentiment has decided that the stoves must go, and the probability now is that the oil lamps will speedily follow the stoves. The progress of electrical science has reached a point which makes the successful lighting of cars by electricity no longer doubtful, the only thing to be determined being a choice of methods, or the most economical source from which the electricity is to be obtained. In view of the fact that two or three passenger trains lighted entirely by electricity are now running in this country with results that are said to surpass all expectations, the choice as to methods can not long remain in suspense.

Assuming, then, that a great and radical improvement in car lighting is impending, and that the new light will be in brilliancy all that its name implies, we would make a note of the fact that in spite of the miserably insufficient light derived from oil and gas during all these years of waiting and grumbling, there were always a few exceptional cars, and even whole trains, that were well and satisfactorily lighted, and this quality of light, by way of distinction, was called "illumination." In other words, the cars could be well lighted with oil or gas, if enough of it was consumed and there were plenty of burners. What was wanted was the requisite quantity of light irrespective of the ingredients consumed in producing it. That quantity, as a rule, we didn't get nor don't get, although there is an abundance of oil and gas from which to make it.

Now if we are going to have electric lighting for cars, let us have something besides the name; that is to say, let it be a light that will enable people with good eyes to read election returns and double-leaded editorials with perfect ease in crowed local and way trains on dark November evenings. This can not be had if the illuminating agent is to be stinted to a limit of cost inadequate for the purpose. Assurances are given, however, that the cost will not be as great as the cost of oil for the same quantity of light. But even if it should be more, it will be a sufficient compensation to be rid of the heavy and cumbersome car lamps, which are handsome enough as ornamental appendages, but however skillfully designed, are none the less oil receptacles that emit smoke and heat, cast a shadow where no shadow is needed, and break and slop over when the cars get off the track and roll down the embankment.

Causing Train Accidents by Rule.

The Time Convention of railroad managers and superintendents which met in New York lately, adopted the code of rules which were provisionally adopted six months ago. The rules are supposed to cover the whole system of train operating, and the purpose is to make the rules uniform on all roads, a most desirable improvement on the existing state of confusion. By the new code, a uniform system of signals by lamps, whistles and other methods is established for all roads that were represented at the convention. Uniform methods and regulations for timing, controlling and starting trains, rules for running trains on single tracks, for switching, and for side tracking, are covered by the code.

This is a movement in the right direction, for it is undeniable that many accidents have been caused by ambiguity of rules for train movement framed by men who did not properly understand the subject, or did not know how to express themselves in plain English; and many other accidents have occurred through trainmen changing from one road to another and getting confused by the change of signals. In addition to this, many loose methods of operating were permitted which a convention of intelligent managers and superintendents is not likely to sanction.

A fruitful cause of collisions on single track roads is the absence of specific rules as to how certain trains shall approach way stations. The Time Convention has taken no action in this matter, the members thinking it ought to be left to the decision of individual roads. A common case is thus: A wild train, conductor Smith, gets orders to run from A to K, avoiding regular trains, and it may be that the conductor and engineer get orders to run faster than the time card speed, which indicates that they are required to get over the division as quickly as the run can safely be made. They do not expect to find any obstruction at stations where regular trains are not due, and they are not prepared to stop at stations where they are not expecting to find trains. The first stop they expect to make is at D, and they are running to pass C, when they go round a curve close to the station and find a wild train, conductor Jones, coming from the opposite direction standing on the main track. A collision happens, and conductor Smith and his engineer are laid off or discharged. In most cases conductor Smith and his engineer would be notified a station or two ahead, that they would meet the train in charge of conductor Jones at C, but this is often neglected even on roads where there is no rule requiring all third-class trains to approach all stations prepared to find trains on the main track. The roads that are worked in this way put all responsibility for accidents on trainmen. The company or its officers practically say to the trainmen, you must get your train over the road promptly, which means that certain stations can not be appoached slowly, but the same officers make no provision for keeping the track clear, and when the inevitable accident happens the men are put in the wrong.

There are several remedies for this source of accident:

1st. Make a rigid rule requiring all trains not having absolute right to the road to approach all stations prepared to find trains on the main track. The great objection to this kind of rule is that many stations are situated so in regard to the grades that to approach them slowly means doubling the hill, and the practice would entail great extra expense to the company, besides delaying the movement of trains.

2d. Require train dispatchers to follow an inflexible rule to notify trainmen in advance if a train will be at a station where its presence is not indicated by the time card. There are several serious obstacles to carrying out this plan. To carry it out strictly, trains would often be delayed till orders could be given to other trains, and night operators would be required at more way stations. All things considered, this is, however, the most practicable plan.

A third plan would be the introduction of signals for the protection of stations so that when trains got within the yard limits they would be held safe. Where traffic is heavy this is decidedly the most sensible and safest way to handle trains, but the expense is too great for light business. It is high time, however, that the more important stations on even light traffic roads had the benefit of signal appliances to protect trains or to indicate that trains could approach to the platform without danger.

When a collision happens between two trains, and they are so common that to keep count of them for a month is tedious, it is prima facie evidence of carelessness on the part of some one. If railroad companies are to do anything towards holding their train employés to stricter account for causing accidents, they must be careful to see that their own rules are not framed to make collisions probable.

The Master Mechanics' Convention.

The business arranged for consideration at the approaching Master Mechanics' Convention gives good ground for the expectation that the the meeting will prove both profitable and interesting. The loss of the president will occupy the attention of the association soon after the meeting convenes, and the personal popularity of Mr. Woodcock will lend sadness to the reflection of many that he has attended his last convention. The association will, however, be fortunate in having an excellent presiding officer in Vice-President Johann, a circumstance which will do much to push forward business and make the best of the limited time available for discussion.

Eight subjects are under the investigation of committees. Most of them are in the hands of energetic workers, who are likely to bring out all facts worthy of attention. Nearly all the subjects offer ground for conflicting views, and several of them have already been discussed in railroad clubs. All this would lead us to believe that there is likely to be interesting reports submitted, and lively verbal discussions thereon.

Proportion of Locomotive Cylinders, a most important subject, which has received too little consideration from our designers, is in the hands of Charles Blackwell, F. L. Wanklyn and T. E. Barnett. Mr. Blackwell has devoted great attention to this subject, and his views are certain to reflect a clear light where much darkness yet prevails.

Traction Increasers is under investigation by R. H. Briggs, D. O. Shaver and T. J. Hatswell. Mr. Briggs has been a warm advocate of traction increasers where they were likely to do any good, and Mr. Hatswell also has had some experience with them, so the association is likely to learn more about the effects on locomotives of traction increasers than has hitherto been known.

Cross-Heads and Guide-Bars, an important feature towards securing safety and durability to the working parts of locomotives, is under investigation by N. W. Howison and J. B. Henney, both of whom have had considerable experience in the building of locomotives, and are likely to judge fairly the merits of the various types.

Steam Packing, which includes the various forms of piston packing, and aims to find out the most economical and satisfactory packing for piston rods, valve stems, regulator and air pump stuffing boxes, is in the hands of J. W. Stokes, Allen Cooke and Henry Schlacks, and all of them are working industriously to obtain the facts necessary for a full report.

Locomotive Preparation, an important subject which has received a singularly small share of attention in the past, will be reported on by G. W. Ettenger, W. H. Thomas and T. W. Gentry, all comparatively new but able members. The subject embraces washing and lighting up locomotives, showing the best system in use for washing out, and most economical and expeditious mode of raising steam and the necessary plant for the same. Methods of washing out have been improved from time to time, and they are now fairly efficient in the regions where bad water makes washing out an important operation; but lighting up remains practically where it was fifty years ago. If the committee succeed in devising means of firing up that will dispense with the ancient woodpile, the members will earn the gratitude of all the railroads in America.

Coaling up Locomotives is another subject that has been little discussed, probably because on many roads the motive power department has nothing to do with handling coal, and the average master mechanic who has that work under his charge wishes it was in other hands. The subject is in the hands of J. Davis Barnett, James Strode and Charles Graham. On most roads the tenders are loaded with coal by the crudest kind of appliances so far as recording accuracy of supply is concerned. In fact, the quantity of coal put on is a matter of guesswork. While a company can not tell with any degree of accuracy how much coal has been supplied to the various locomotives, the officers can not with justice hold enginemen very strictly to account for fuel wasted. If the report of this committee leads to improvement in the methods of handling coal, it will effect an important work towards fuel saving.

Standard Form of Tire Section is a subject continued, and is practically closed in a way that reflects great credit on the committee, J. N. Lauder, Jacob Johann and N. H. Sprague.

What control has the Engineer over the Wear of Driving Wheel Tires? is a question of the utmost importance that John Mackenzie, J. S. Graham and Fred. B. Griffith are trying to get answered to the satisfaction or discontent of the association. We suspect the verdict will be that he has the greatest possible control over the wear of tires, but whether or not he always exercises this control wisely and well is another question.

There will also be brought before the convention the re-

port of the committee appointed last year, consisting of J. D. Barnett and M. N. Forney, to revise the Constitution and By-Laws of the Association. We have heard it rumored that this committee will recommend radical changes which will make the constitution closely resemble that of the Master Car-Builders' Association. We can not see where the Master Mechanics' Association would be likely to receive new vigor or benefit from a change of that kind, and we think it very unlikely that the members would sanction any material change in the constitution.

The Freight Car Brake Tests.

So far as can be seen from the present status of the automatic freight brake question, the tests of brakes at Burlington last summer were useful only in demonstrating the weak points of existing brakes in their application to extremely long trains with considerable slack in the couplings. For emergency stops the best of the brakes were too slow in applying the shoes to the wheels throughout the whole train, and caused severe shocks that would be dangerous in practice to stock trains and trains loaded with fragile freight. The aim and determination of the various brake companies since the tests were closed have been to overcome the defect described and to produce the means of applying all the brakes instantaneously throughout the whole train.

At the approaching brake tests, to be commenced at Burlington, May 9, it looks as if there would be some extraordinarily quick stops made. So far as we can learn, most of the brake companies have called electricity to their aid as an auxiliary in applying the brakes, and by that means the mechanism under each car in a long train will receive its impulse to apply the brake at practically the same instant. This will be all very well and interesting for special experiments in quick and uniform application of brakes, but we do not see that the results will teach much as a practical lesson. An electrical attachment may be admirable for a field day test, and yet be entirely unreliable for every day service. Unless it be fairly certain that an electrical auxiliary to a brake can be made a permanent and reliable attachment, we would not want to attach much importance to its assistance in making a few emergency stops. To have the capability of making an emergency stop without jolt, shock or jar, is doubtless a valuable feature in a brake, but making emergency stops constitutes but a small share of its ordinary work, and the committee are likely to put the greatest stress on the apparent fitness of a brake to do its common stop work day by day without fear or failure, with absence of complexity, and presence of the elements of durability.

It appears probable that there will be eight competitions, four air brakes, two electric brakes and one vacuum brake. After many a hard struggle to hold its own alongside of air and vacuum, the machine brake has dropped out, and the American Brake Company are in the front with an automatic air brake. This is the first time in this country when an electric brake has been brought out for a searching test along with other brakes, and the performance of the two to be tried will be watched with interest.

As a side issue in connection with these tests, it looks as if the two leading types of car couplers would have judgment passed upon them. Several of the test trains are equipped with vertical plane couplers, but there will be enough of the two types to decide on the merits of both under various conditions of train service.

Locomotive Proportions.

The attention of our readers is directed to the admirable article in our present issue, by Mr. R. Atkinson, on Proportions of Locomotive Cylinders. This subject is of the very greatest importance to railroad companies. The difference between success and failure of many locomotives lies in the difference between correct and wrong proportions of cylinders. Many master mechanics are coming to appreciate the real importance of this feature of locomotive design, and the subject will doubtless occupy a large share of the attention of the Master Mechanics' Convention at St. Paul. Mr. Atkinson is a competent authority on the subject, and the thorough way in which he discusses it is interesting as well as seasonable. He is at present chief draftsman for Mr. F. R. F. Brown, mechanical superintendent of the Canadian Pacific Railroad, was brought up on the London & Northwestern Railway under Mr. Webb, and was for a time with Sharp, Stewart & Co., locomotive builders, Manchester, England. We cordially welcome Mr. Atkinson to the pages of the NATIONAL CAR AND LOCOMOTIVE BUILDER.

One Sided Sympathy.

Railroad Commission Coffin, of Iowa, in a recent communication published in the *Railway Review*, refers to the universal demand for safer methods of car-heating, occasioned by the Rio, Tiffin, White River and Bussey Bridge casualties, and wonders why a greater outcry is not made against the old couplers, hand-brakes and unprotected frogs, which are instrumental in killing and crippling upwards of 18,000 railroad employés every year. The reasons, as it seems to us, are quite obvious, and are to be found in the attending circumstances and the infirmities of human nature. The victims of one class are slain or crippled by the score in a single crash occurring at comparatively long intervals, while those of the other and larger class drop dead or are carried to the hospital every day one by one. In one case they are with few exceptions patrons of the road, consisting of men, women and children from all classes of society, while in the other they are employés of the road in inferior grades of service. It is natural, therefore, that of the two classes of victims, the smaller number should receive more attention and sympathy than the larger. This, however, is all wrong. When human life is at a stake there should be no discrimination in affording the means of protection against danger or in sympathy with the sufferers. But it is a fact, nevertheless, deplore it as we may, that public sentiment does discriminate in spite of the formidable statistics furnished by Mr. Coffin showing the deadly work done by couplers, brakes and frogs. These statistics make little or no impression because they have become threadbare from repetition. Every body knows them by heart, and yet they give rise to no widespread agitation or concerted movement to cure the evil. The only effective remedy would seem to be some kind of legislation that will tell more directly on the pockets of stockholders. The responsibility primarily rests with them, and only secondarily with directors, and in a still less degree with managers and superintendents.

THE places at which the annual conventions of the Master Car-Builders' and Master Mechanics' Associations will be held this year, being so far away from the geographical center of our vast railroad system, may seem to lessen the probability of a full attendance of the members on account of the long journeys to be made and the time required to make them. There may be something in this so far as the representatives of Southern roads are concerned, but from the great belt of territory extending from the north Atlantic to the Pacific coast there will be no falling off. Aside from the important business to be transacted, there is a strong and very natural desire on the part of car-builders and master mechanics connected with railroads in the Eastern and Middle States to see with their own eyes the marvelous development of railroads in the Northwest and the phenomenal growth of towns and cities which a few years ago had no place on the map. Of these, Minneapolis and St. Paul, only ten miles apart, are conspicuous examples. A generous hospitality will no doubt be extended to the two associations during their stay, and an opportunity afforded the visitors to see and appreciate the many local attractions of the wonderful region where the blizzards disport themselves and the cyclones make havoc in their season, but are very properly kept tied up during the month of roses.

IN noticing the annual report of the Master Mechanics' Association, two months ago, we neglected to mention that these reports can be procured from Secretary Setchel for $1.50 each. The reports contain so much valuable information about railroad mechanical matters that every man interested in the business ought to have them.

Goodwin Dump Cars.

One of these cars (No. 357) made some trial trips recently between Cleveland, O., and Sharpsville, Pa., the result of which is reported as follows:

The car (4 wheel) was loaded by hand with 23,740 lbs. of ore, at Cleveland, Jan. 10, arrived a Sharpsville Jan. 13, and was dumped on the 14th; was then loaded from a platform with 10 tons of slack, arrived at Cleveland on the 19th, was held there until the 22d, then loaded with 27,800 lbs. of ore, arrived at Sharpsville again Jan. 26, was again loaded with 10½ tons of slack, sent to Cleveland on the 29th, and on Feb 2 returned to Sharpsville with 20,800 lbs. of ore. On account of a strike, the car was held at Sharpsville several days, then leaving empty for Cleveland Feb. 9, and arriving there on the 11th, having made a mileage of 504 miles. Had the car been in regular service it is assumed that it would have made another round trip within the time, with a mileage of 672 miles, or 85 and 56 per cent., respectively, more than two 8-wheel gondola cars actually made between the same points. The tonnage service of the Goodwin dump was 4,760 ton miles, or something more than the average of the gondolas in the same trade. Had the round trip, lost by detention, been made, the dump would have made 6,613 ton miles, or 36 per cent. more than the 8-wheel gondolas.

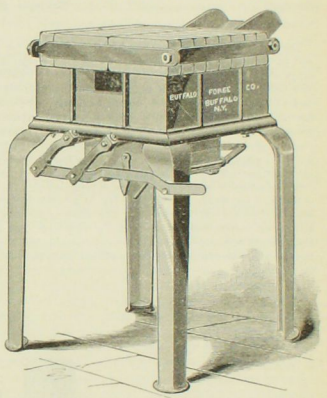
MR. REUBEN WELLS, who has been for several years superintendent of machinery of the Louisville & Nashville Railroad, has accepted the office of superintendent of the Rogers Locomotive & Machine Works, at Paterson, N. J. Mr. Wells has long been a prominent member of the Railway Master Mechanics' Association, and was at one time its president. His large experience in the locomotive departments of railroads eminently qualify him for his new position, and the Rogers Co. is to be congratulated in securing his services.

YOU can't grate spice from a wooden nutmeg, nor jump across a ditch at two jumps.

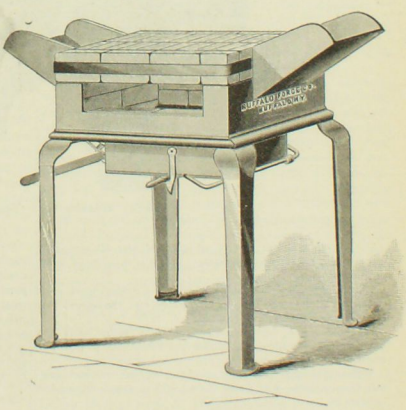
Smash-Up Pictures.

The pictorial epidemic which has raged with such virulence in the daily and weekly papers has, of late, seized upon railroad smash-ups as good subjects for illustration; and it must be admitted that in some instances the realistic truthfulness of the performance is a fair reproduction of the horrors of the scenes depicted. These sketches are, of course, taken on the spot, and are so true to life, death and promiscuous ruin generally, that most people with weak nerves recoil aghast from the spectacle. No description is needed to indicate which is the top of the picture and which is the bottom. This can always be determined by noticing the people in the foreground and the trees in the background. Although a mere glance leaves an impression more or less lasting, it is only when the details are looked at through a magnifier that every thing "stands out," as it were, so that all the minor points can be studied. You then see each individual splinter, every flaw and crack, can trace every fracture in the window glass, scan every structural weakness due to contract work and shoddy materials, and thus fix the responsibility of the accident where it belongs. The saddened faces of the groups of people here and there, the wintry look of the leafless trees and the snow-clad hills in the distance, are also noticeable among other accessories. These smash-up engravings are so startingly graphic that some of the best of them are almost deserving of a place in a gallery for preservation, to show to posterity the state of the arts and the perils of traveling in the present stage of railroad progress.

Buffalo Forge Co.'s Heating Forges.

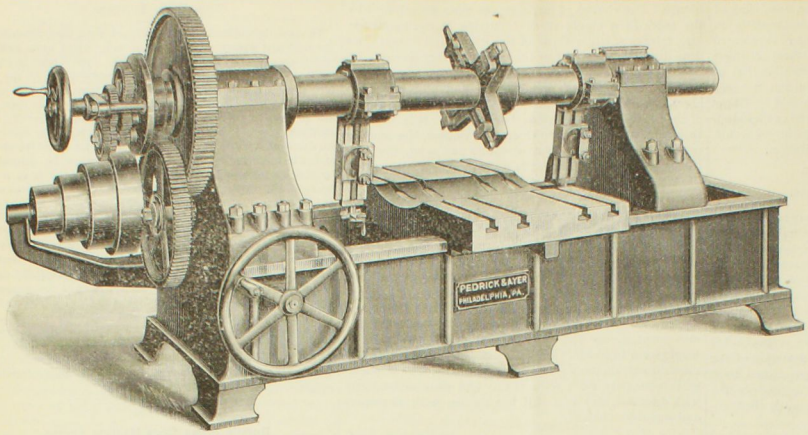


No. 31.



No. 32.

The cuts represent two heating forges manufactured by the Buffalo Forge Co., Buffalo, N. Y. Hard coal or coke can be used in them. They are designed for heating a great variety of work, such as bolts, rods, axes, hatchets, hammers, band iron, etc., also for cutting, bending, forming and forging purposes. A number of pieces can also be heated at a time, thus keeping the operator fully supplied with heated work to be operated upon, and will be found especially advantageous for use in connection with helve and steam hammers. They have double shaking grates and blast gate for regulating the blast. The sizes manufactured by the company are numbered from 31 to 37 inclusive, and are made with openings on one or both sides and coal chute on one or both ends, also with openings on one or both ends and coal chute on one or both sides. Nos. 32 and 33 with openings on both ends, make a very desirable double forge for short light work.

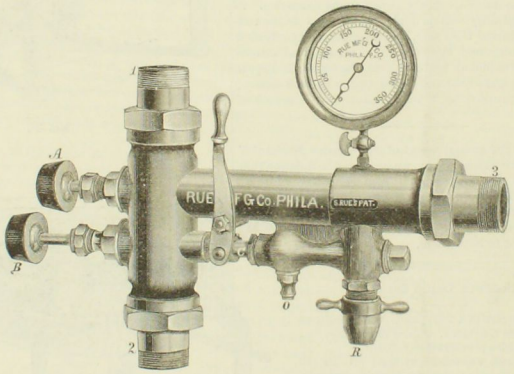


Cylinder Boring and Facing Machine, No. 2.

The engraving represents a very effective machine for boring and facing cylinders. It is manufactured by Pedrick & Ayer, proprietors of the L. B. Flanders Machine Works, Philadelphia. It is built very heavy and of different sizes, is powerfully geared and will bore cylinders from 10 to 25 inches in diameter. The bar is solid forged steel, with steel screw and bronze thrust bearings. The feed-casing is made to feed either way and has two changes, to operate which it is only necessary to push in or pull out a pin in center of hand-wheel. The facing head can be placed on bar quickly, and in any place desired, and if necessary can be operated at same time cylinder is being bored. The bed is movable on the shears, and is easily set in position by the hand-wheel at forward end of machine. The cutter-heads have a long bearing on the bar, and are arranged for four tools, that number being found by experience to be the most desirable, as it distributes the stress or strain on the bar, and four times the metal can be removed.

MR. F. J. CLAMER, of the Ajax Metal Co., of Philadelphia, has discovered a process by which pure lead may be deposited as a coating on iron, steel or other metallic surface, so as to protect it from rust or oxidation. Metals so treated may be exposed to a red heat without injury to the coating. The process is applicable to bolts, nuts, bridge structures, telegraph wires, iron roofing, steam boilers, etc., and is not only a protection from rust, but increases the bearing strength and life of the metals. The company will in a short time be ready to make a practical application of the process.

THE PATENT SUIT brought a number of years ago by Hicks & Smith against the Chicago, Milwaukee & St. Paul Railway Co., the Dayton Manufacturing Co., et al., for alleged infringements of the Hicks & Smith patents on car lamps, has been dismissed, a settlement of the controversy having been agreed upon, and a license given to the Dayton Co. to use the Hicks & Smith patents.



Boiler Washing and Testing Apparatus.

The apparatus shown in the cut will wash out, fill, and apply pressure to a boiler, with hot water. It has a capacity of 4,000 gallons per hour.

When this apparatus is used, the boilers are washed much more effectually than can be done by cold water, and the temperature of boilers is not materially reduced.

It enables you to blow out, wash, and fill with hot water and have engine ready for service within one hour, without injury to the boiler.

When applying pressure, this apparatus will produce and maintain from three to five times the amount of steam required to operate it.

One of the many ways it may be located: Take cold water to the apparatus out of, and put hot water back into, the pipe that supplies water for washing with cold water, always putting in a stop-valve or cock between the connections. The hot water from the apparatus will pass with great force through the same pipe, hose, nozzles, etc., as are used with cold water.

This apparatus has connection for 2 inch pipes, and *must* be *located* where the water will flow *to* it.

Manufactured by the Rue Manufacturing Co., Philadelphia, Pa.

THE ALLEN PAPER CAR WHEEL CO. have removed their general offices from New York to Chicago, to which place all communications should be addressed. The New York offices of the company are at 31 and 33 Broadway, and are in charge of Mr. J. C. Beach, vice-president of the company. They are also the headquarters of Mr. L. F. Tracy, the company's Eastern agent. Communications in reference to Eastern business may be addressed to the New York offices, where they will receive prompt attention.

THE EGAN CO., Cincinnati, O., have issued a handsome poster, printed in colors, containing engravings of 63 of the company's wood-working tools, also information as to the correct way of putting rubber bands on wheels of band-saw machines, brazing band-saw blades, calculating speeds of pulleys, etc. The company will mail a copy of this poster to master mechanics, car-builders and wood-workers, on receiving their address stating that they saw this notice in NATIONAL CAR AND LOCOMOTIVE BUILDER, and on condition that the posters will be put up in a prominent place.

E. GOULD & EBERHARDT, of Newark, N. J., are getting out an entirely new Automatic Rack Cutter capable of cutting racks only. This is something long desired by machine and tool manufacturers. With the exception of one or two very expensive and cumbrous machines, no machine has been built thus far for this purpose. In this machine the work is done with perfect accuracy, requiring only so much of the operator's time as is necessary to set the work and start the machine.

EDWARD KENDALL, Geo. F. Kendall and James H. Kendall have formed a copartnership under the firm style of Edward Kendall & Sons, to continue the business heretofore carried on by the late firm of Kendall & Roberts, of Cambridgeport, Mass., manufacturers of hoisting machines.

THE NEW YORK RAILWAY SUPPLY CO., LIMITED, has been incorporated as a stock company, with an authorized capital of $100,000, for the purpose of transacting a general railway supply business and negotiating railway securities and contracts. Office, 40 and 42 Wall street.

ORDERS have been given for 48 new cars for the East River Bridge. These cars will be equipped with the Eames Vacuum Brake, which is also in use on the bridge cars now in service.

THE Western office of the Standard Steel Casting Company has been removed to Room 15, Quincy Building, Adams and Clark streets, Chicago. H. Burkhardt is general agent.

THE National Car Roofing Co., of Wheeling, W. Va., has opened an office at 18 Cliff street, New York, which is in charge of Mr. H. C. Mechling, General Agent of the company. The company is prepared to furnish roofs of its different makes at short notice. Address general agent as above.

The Importance of Little Things.

The great end at which all improvements aim is the maximum of power combined with the minimum of material and weight. A man shoveling dirt with a shovel one pound heavier than it should be, will lift 6,000 pounds more in a day of ten hours than he would with a shovel one pound lighter. All this strength is wasted. The same is true of machinery. So simple a thing as an unlubricated pulley is felt in the furnace, and the cost of the coal is augmented. Every useless pound in a truck or carriage takes vitality from the horse which draws it, and costs the owner many extra dollars for his keeping. The professional oarsman, the pugilist, the racehorse, carries as little surplus flesh as possible. Yet there are workingmen who carry fifty pounds more flesh than they need for the best working condition, a burden which tells against their efficiency and personal comfort through many years of their industrial life. These may seem little things; but whatever wastes power, increases expenses and burdens the laborer, is not a little thing.

Our Directory.

We note the following changes since our last issue. Our readers will do us a great favor by giving us prompt notice of any changes that may come to their knowledge or of any errors that may be noticed in our list:

Baltimore & Ohio.—Wm. M. Clements has been appointed Manager of the lines east of Ohio River, and W. W. Peabody Manager of the lines west of Ohio River.

Batesville & Brinkley.—John White has resigned as Master Mechanic and has gone to the Kansas City, Wyandotte & Northwestern.

Buffalo, New York & Philadelphia.—W. J. Davis succeeds H. J. Bookhammer as Master Mechanic.

Chicago, Santa Fe & California.—M. J. Rogers, late of Missouri Pacific, has been appointed Master Mechanic, and John Hodge Master Car-Builder.

Chicago & Northwestern.—W. A. Scott has been appointed Superintendent of the Madison Division, in place of C. A. Swineford, resigned.

Cumberland & Pennsylvania.—L. S. Randolph, late of Florida Railway & Navigation Co., has been appointed Master of Machinery.

Denver & Rio Grande.—David H. Moffat, of Denver, Col., has been elected President in place of W. S. Jackson, resigned.

East Tennessee, Virginia & Georgia.—E. B. Thomas has been appointed General Manager.

Florida Railway & Navigation Co.—W. D. Ballentine has been appointed Master of Machinery, vice L. S. Randolph, resigned.

Grand Tower & Carbondale.—J. D. Peters has been appointed Superintendent.

Housatonic.—William K. Lyon has been appointed Superintendent.

Kansas City, Fort Scott & Gulf; Kansas, Springfield & Memphis.—W. W. Fagin has been appointed Superintendent of these lines, in place of L. W. Towne resigned.

Louisville & Nashville.—Reuben Wells has resigned as Superintendent of Machinery to accept the Superintendency of the Rogers Locomotive Works. Wm. A. Kelloud has been appointed Assistant to General Manager; and R. S. Miner, late of the Louisville, Evansville & St. Louis, has been appointed Superintendent of the South & North Alabama Division.

Marquette, Houghton & Ontonagon.—Andrew Watson has been appointed General Manager and Superintendent in place of John Hornby, resigned. Mr. Watson is also Superintendent of the Detroit, Mackinac & Marquette.

Milwaukee, Lake Shore & Western.—H. W. Reighley has been appointed Purchasing Agent.

Mobile & Ohio.—Geo. D. Harris, late of the Richmond & Alleghany, has been appointed Superintendent of Motive Power. J. E. Capps has been appointed Master Car-Builder, and J. H. Dougherty Acting Master Mechanic, at Whistler, Ala.

New York, New Haven & Hartford.—Henry A. Bishop has been appointed Purchasing Agent.

Northern Pacific.—Geo. W. Cushing has resigned as Superintendent of Motive Power, and W. T. Small has been appointed his successor.

Richmond & Alleghany.—Wm. Hassman has been appointed Master Mechanic, vice Geo. D. Harris resigned.

Employment.

WANTED.—By a first-class Ornamental Designer, a position as Assistant Mechanical and Architectural Draftsman. Would prefer a position in a railroad shop. Can furnish first-class references. Address "T Square," office of the NATIONAL CAR AND LOCOMOTIVE BUILDER.